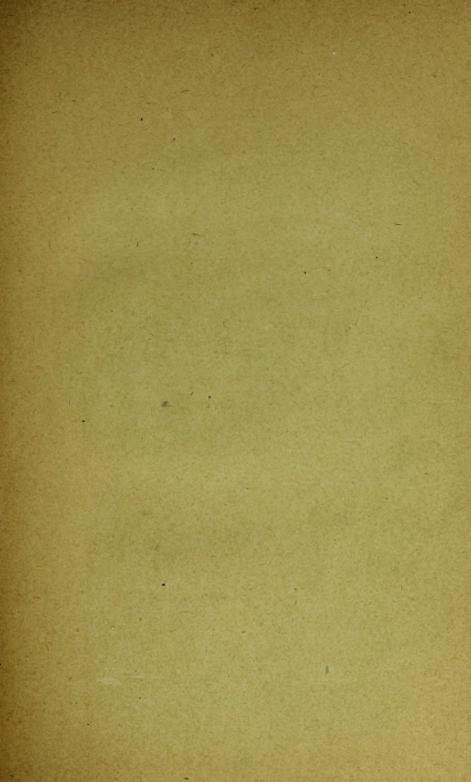


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OF

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WITH SPECIAL REFERENCE TO

THE PATHOLOGICAL ASPECTS OF INSANITY.

BY

W. BEVAN LEWIS,

L.R.C.P. (LOND.), M.R.C.S. (ENG.),

MEDICAL DIRECTOR, WEST RIDING ASYLUM, WAKEFIELD; LECTURER ON MENTAL DISEASES AT THE YORKSHIRE COLLEGE; EXAMINER IN MENTAL DISEASES TO THE VICTORIA UNIVERSITY.

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THE AUTHOR.



PREFACE TO THE SECOND EDITION.

SINCE the appearance of the First Edition of this Treatise great advances have been made in our knowledge of the indimate structure of the Nervous System. The new methods of Golgi and his School have thrown light on many obscure points in neuro-histology, and the doctrine of the neuron and neuron chains has had a paramount influence upon problems in zerve physiology and pathology.

It is hoped that the revision of the Anatomical Section faithfully reflects the charge which has some over our conception of the nerve-cell, and that this section correctly and concisely expresses the more essential facts which recent research has established. The large number of additional plates and illustrations in the text will, it is believed, he welcomed in this section: most of them are from original drawings by the Author.

In the Clinical Section will be found, as additional matter, a chapter on Progressive Systematised Insanity; an account of certain forms of Impulsive Insanity; a description of the reaction-time instrument; estimation of muscular sense discrumination in general paralysis, alcoholism, &c.; and a separate chapter on the Treatment of Insanity. Much matter considered less essential has been eliminated.

In the Pathological Section, the Author has maintained his views of the importance of the Scavenger-cell as a meebid factor in the changes found in the brain of the insure, nor does he find in recent criticism of this view any solid reason for a modification of his opinion as to the rôle played by it in insurity.

Finally, he would express his grateful approxistion of the flattering reception accorded to the First Edition and his great indebtodness to his Publishers, who have spared neither expense nor care in the production of the Second Edition.

WEST RIDGE ACCION.
WARRIELD, December, 1899.



PREFACE.

In writing a new Treatise on Meanal Diseases, I have not been blind to the wealth of available literature in this department, nor to the claims upon the Student's attention of such works as the classical Manual of Bucknill & Tuke, the English translation of Griesinger's Treatise, and the admirable Lectures of Dr. Blandford, nor again to the more recent additions to Dr. Bristowe's Clinical Medicine, and the works of Drs. Sankey, Clouston, and Savage.

It has, however, been my special object to present a resume of our knowledge of the atructure and connections of the corebro-spinal nervous system, of the architecture of the corebral bemispheres, and more especially of the cortical suvelops as the essential organ—the material substratum—of Mind; and to afferd a concise account of the morbid changes found in the brain of the insane, as viewed in the light of recent research

It appears to me that a disproportionate amount of attention has been paid in former text-books to the clinical aspects of Insanity, and it is hoped that this attempt to deal more fully with the organisation of the material substrutum of mind, and with the evidences of morbid change to which it is prone, will not prove unwelcome to the Student of Mental Disease.

In the Anutomical Section, I have undeavoured to comprise such information as shall prove of utility to a more thorough conception of the ground-plan and superstructure of the nervous system; and it will be at once evident that special emphasis has been advisedly bestowed upon the cortical envelope—the structure, unture, and autonomy of the nerve-cell. The Clinical Section comprises statistics based upon an analysis of 4,000 cases of Insanity in both sexes, trented at the West Riding Asylum.

In the Pathological Section, I have endeavoured to do justice to certain morbid processes, which appear to use to be of paramount importance in the history of Insanity; and more particularly would I here alliade to the functions of the Lymphconnective system of the Besin, and the life-history of the "Scavenger cell."

To my Publishers I would desire to express my acknowledgements for the consideration uniformly received at their hands, despite the delay which has unavoidably occurred—for the liberal supply of illustrations, so essential to the success of a work of this description, and for the special care taken in their production. I can soid my testimony to the admirable faithfulness with which my drawings have been reproduced by Mr. Danielson.

I have also to express my obligations to my colleague, Mr. St. John Bullen, for reference to a compilation of Statisticsfrom the Pathological Records of this Asylum, and for material assistance in the revision of the proof-sheets.

White Emiliary Application, Washerento, Normalor, 1889.

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A. Sub-treetal and and parcetal argument of the limits factor. B. Gyrna Supposings or lower limits are. C. Limbis factor. D. Occapital pole. E. Frental pole. F. Offictory halfs. G. Optis tract. L Officiary root. J. Corpus callocats. K. Pertendenbut. S. Sylvian depression. T. Limbis factor. The types of cortex are indicated by the adjacent advence.

PLATE IL

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Fro. L. CREENILLE COURSE OF YOURS PAR.

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Fat T.

Section across famous showing arborisation of dendritor of cells of Parkings and their descending assum. Sublimate preparation: a 11th.

PLATE III.

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For, I. CHARLETTER COURSE OF MOTOR,

Sharing cells of Parkings, generales, and more fibers. Sublimate perparation, a 110.

Po. T. Cramman, sh training or Max-

Showing stellate cells in mighbouriess of sells of Purkings, distributing househes appeared to the perspheral inner section token across limits. Sublimate propagation.

— 100.

PLATE IV.

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Proj. L. Creenmann Course (Memora

Section in direction of famina shows large stellate nerve-sell pear cells of Poskinje; the laster use transated; a few terminal desdrices occupy units half of peripheral same, the horizontal three being derived from the granules below. Sublances preparation: — 180.

Fig. 2. Chaptrony Braze by Ray (Sant-schools,

Arrangement of entre-orde in relationship to their centric and periphers dis-

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Post 2. Conver Antenna or Yorks Blay.

Shows pyramidal nerve cells of Constant granules of famia destata. Subfinance preparation. 110.

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Fig. 2. Crossess. Course or Rev.

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Fra. 2. Greatestan Correx (Motor).

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For. 2. Schicus; be Thermont Layron by Manually,

As trademical by the more recent researches of Ramon's-Cajid.

PLATE X.

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Fig. 1, "Sussant Course,"

Taken from the "undified upper limbs" type in the heals of the subhit. This area is represented in the small figures on the rabbit's brain on this plate by the delited arms covering the inner and month aspect posteriorly, internal to the parental solves. K.

FOR S. P. MOSSIEGO CLEMPTORY TYPE.

Takes from the posterior extremity of the forms limits any of the reliable's brain.

The area is represented in the first of the three figures, and is lettered T. The large swellers cell of the second layer is a rotable feature of this certical area is 210.

PLATE NL

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FOR T. CREEREN, CORPER OF RAY,

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Sponsilly propared to show relationships covering between the narro-cells and the lymphatic characts and morales of covers. The consection of the percellular area with the bland-results is alonely indicated, as in also the arching of the nativent trend around the aero-cell. The partitionalar sinks in some cases alone indicate the position of the lymphatic shouth.

PLATE XIII.

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Fig. 1. Servan bityonion-certi or this Photo (Vos Lasmonius).

The nucleus shows a deep stateout analosius, a faint lines not such beset with chromatin granules. The files element is faintly represented in the sytophases, but the chromophilic generales of Nied are a notable feature, together with the fence granulus vertex because the nucleus, representing the so-called controusses. Two small connective times cells appear to the left. This figure is becovered from Wilson's The Coll in Development and Inhirobasce.

Par. 2. Course to Commune (Pro, 1901 parts starle

Saldinate preparation takes from mar revisal aspect of benisphere. Sublimate preparation, = 116.

PLATE XIV.

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Pro. 1. Decemberation of Ministration Fronts in Largest Contract of Spinish Comp. registry. se-called "Ministry Schemosts," as new union & Lowreways Competition.

The pule modulus attentions are the "military" purches into which remove and modulators filters are seen to pass; most of mich patches are multimediar, and are manuscraftly deep strings schemed insert.

Pro. 2. "Contour" Parents materies rave Desirenates as Materializates Francia de Servas, Consequente House, Materiette.

The multilocalar constitution of the patrit is indicated by delicate outlines; and sylinders deroid of modulis are som passing into the degenerated forms; and searceager cell is seen thrusting to multipling processes into the substance of the collect patric.

Pro. 2. "Controls: Partie evill mone History Management to more than Outputs or Mentinophila Marketin wire a Pear Strains of Reserve Pressor Asserve. ... 200.

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Portion of inferior clivary and accommon of cury bodies in a case of gloss-laistlarguaged paralysis (T. F., p. 629), showing spheroidal products of degenerated modulated files, and the complete immunity from morbid change presented by the gray matter.

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PLATE XXII.

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The survivials are seen in different stages of degeneration—weeller, irregular, and determed, devoid of branching processes, or reduced to a fertaless being of generals differential mechanical the numbers. The survenges cells contain numerous survey generals in their interior, deeply stained and smaller to the products of nerve-distotyration around them. × 500.

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A TREATISE

ion

MENTAL DISEASES.

PART I .- ANATOMICAL AND HISTOLOGICAL SECTION.

Contents — The Spinal Cord — The Medella Ohlougata — The Mesescophales — The Thalamencephales — The Presencephales — The Encephales as a whole—The Combail Cortex — Cortical Laurination

THE SPINAL CORD.

This cerebro-spinal axis consists of a series of longitudinally disposed columns of white medullated nerve fibre, arranged around a central axis of grey ganglionic substance, which in its turn surrounds a central cavity or cavities. Both white and grey columns constitute symmetrical and bilaterally disposed halves, reminding us of the double ganglionic coed in the invertebrata, and are connected across the middle line by a system of commissural fibres, and by certain tracts of the white columns which decuesate from the one half into the other at different levels of the system. We have certain points to allude to, both as regards the idea of "medullated columns" and the central "grey axis," as well as the "bilateral symmetry" referred to, ere we describe in detail the structures themselves.

In the first place, the central grey axis surrounding the central envity should not be considered altogether in the light of a uniform column of grey matter, but rather at a series of gangliouic masses, which, fixed together along the whole length of the spinal coul, become discovered into separate masses in the modulla oblingata, and into the such larger and more important ganglionic masses at the base of the cerebrum. Although fixed in the spinal coud, an indication of the primitive ganglionic type of the intertelevate can still be traced in the enlargement of the grey substance at the level of such spinal nerve, mapping off, as it were, each spinal segment from its mighbour above and below it.

In the next place, the columns of white meduliated fibre are not continuous tructs throughout the whole cerebro spinsi axis; they constitute rather a multiplicity of smaller columns, each of which varies in its destination, and consequently in its longitudinal extent. We may correctly pressure that—taking as the longest course pursued by these medalisted trusts that of fibres arising from the grey cortex of the corebram, and passing down the whole length of the cord to terminate in the motor cells for the lower extremities in the lumbar region—we have between these and the shortest every intermediate length of medallated fibre, interrupted by the ganglicule masses to which it is destined. The electest fibres will probably be a teries of fibres running as longitudinal commissions between the neighbouring spinal segments alluded to: these occur in the anterior and posterior columns of the cord.

We have spoken of the fibres as being "interrupted" by the grey matter, by which we must understand the important fact, that at such points a functional connection is established between the nerve fibres and the nerve cells which abound in the grey matter at these points of interruption, and from which cells a fresh start of fibres is made into other realms.

With respect to the hilateral symmetry of those two halves of the cerebro-spinal axis, it must be also stated that although at a first glunce the various parts constituting the brain, medulls, and spinal continuous appear to exactly reproduce such symmetry of arrangement, yet in the former, a lateral asymmetry is detected by a more careful consideration of its cortical envelope, the convolutionary surface of which varies very considerably in either hemisphere as regards arrangement and complexity of gyri, and superficial order of gray matter. This bilateral asymmetry apparently conforms to the extreme differentiation is structure, accompanying the more independent functional activity of the cerebral hemispheres, and histological research teaches in still since forcibly how infinite become the possibilities for this hemispheric differentiation.

We must likewise attend to the reversal of conditions in the case of the white and grey matter constituting the large cranial gaughtenic structures and the spiral cord respectively. In the latter—the spinal coeff—the grey matter is central, and is invested externally by the white nerve fibre; in the former, as the cerebral hemispherus and cerebellum, the white medulls in central, and invested externally by an envelope of grey certex. We need only made here that the last is the type assumed by those ganglionic levels which form the startingpoint of fibres for centric destinations; the first is the type assumed for the reception of such centric diffusions. Whenever centric threaterminate in this radiate manner, there the grey cortex assumes a nort of suiter capables investment and the medulisted fasciculi its centric core. We shall find this appertain to the radiating fibres received by the cerebrum, the cerebellum, the thalamus, quadrigeminal bodies, the geniculate, and the inferior olivary, in particular; and, in almost all alibe, we shall find even to the perchasi hemispheres, a manufar layer of medullated filters bounding the grey capoular investment.

To revert to the lower or suberdinate levels, or the spinol axis, we learn to familiarise correduce with the disposition and longitudinal direction of its various columns and ganglionis centres, by studying a series of sections taken in different planes and at various levels. For our present purpose, however, it is hat necessary to acquaint curselves with the appearance of its parts as seen in transcerse section. In such a section carried through the hunder enlargement of the cord, we see the irregularly crescentic masses of grey matter disposed in either side and connected across the median line by the anterior and posterior commissures, between which lies the minute orifice of the central canal. The anterior corns or horn is at this site thick, broad, and halbons; the posterior horn, as in other regions, is longer and narrower, directed towards the groove on the outer surface of the cord, which separates the lateral from the peaterier columns, and where it receives the lateral section of the fibres of the posterior roots. Somewhat expanded at its extremity, the posterior corns is obliquely transated from within ontwards, and capped at this site by a translacent substance, the substantia gelatinosa of Rolando; the expanded part so capped, and forming the greater part of the posterior horn, being called the caput. The connection between it and the anterior horn and median grey is called the cervix or neck of the horn. Whilst the lateral segment of the posterior roots passes into the caput. cornu, the median-lying fuscicali arch inwards around the gelatinous substance and ascend in the outermost zones of the posterior column to suber the horn at a higher level, whilst others bend downwards intothe grey trace. Just autorior to these arched fibres, where they enter the cores, and on either inner side of the peck of the horn, is found in the upper lumbar region an insignificant cluster of nerve cells, which at higher levels become an important feature, the vesicular column of Lockhart Clarke,

In transverse sections the cells of this column look inflated and spherical; they are really foriform, as seen in longitudinal sections.* Communicing above the third lumbar nerve, this formation extends up to the minth dorsal, and in still higher regions are found, occasionally distinctly clustered, similar cells which appear as the representatives of the same formation. Dr. Boss traces this formation as reappearing in the lower end of the medulia obleogate, where he considers it to be

^{*}These cells have been spoken of as "bipoles," but this is an error, since few of the elements full to show several processes.

represented by the nucleus common to the origin of the spinal accessory, vagus, and glosso-pharyngesl nerves.

A similar formation appears in the sacral region (origin of the second and third sacral nerves) as the sacral nucleus of Stilling; so that we have throughout the length of the spinal eard and lower end of medicila an interrupted column appearing at the two extreme ends and in the thornoic division, of which the latter is far the more conspicuous, and lies exactly along the plane of emergence of the viscoral nerves (Gaslell).

In the posterior hers, we find sparsely scattered cells of fusiform contour and of small size (15,0), which are regarded as sensory elements probably in connection with the posterior roots.

The anterior horn presents in cervical and lumber regions more compicuous groups of multipolar cells, which vary much in their distribution with changes in the form of the grey matter; these groupings are fewer and far less compicuous in the narrow anterior corns of the dorsal region. The more important groups to be distinguished are five—viz., an inner or median, an anterior, an antero-lateral, a posterolateral, and a central.

Of these clusters the first and last (median and central) are the least constant; and, in the lumber region in particular, do we note the absence of the inner or median groups, although even in this region minute elements tend to appear non-sionally in a somewhat clustered arrangement along the menial border of the grey matter; at all times the inner is one of the least prominent clusters in the horn.

Of the antero-lateral and postero-lateral groups, the latter is the more compicuous, both as regards size of cluster, dimensions, and number of cells.

These two groups scoupy the outer margin of the grey born, the one lying in front of the other, and usually occurioning a well-defined anterior and posterior angular projection of the born.

Internal to these, between them and the inner, and behind the anterier, lies in certain regions a control cluster, also a well-defined group.

In the upper dereal and lower servical region a prominent lateral projection from the outer side of the grey matter betwint anterior and posterior horn has long been known as the intermedic-lateral tract of Clarke: it contains a elester of cells which higher up face with the postero-lateral group already alluded to.

The cuter margin of grey is behind thus site blended in a coarse meshwork with the neighbouring white medulisted strands, constituting the se-called formatio reticularis.

The white medallated substance of the cord investing this central grey mass is roughly distinguished into an anterior, lateral, and

posterior column—the former extending to the outermost roots of the motor nerves; the second from this point back to the attachment of the sensory roots; and the last to the posterior median flaure. These columns are each of them further mapped out into separate tracts, indicated austomically by a distinct groove on the surface and by a difference in the dimension of their fibres; or by the results of embryological research indicating their medallisted development at distinct periods of life; or again, by the facts of the Wallerian degeneration resulting from physiological experimentation or the processes of disease.

By one to other of these means we ascertain that at least eight physiological tracts may be distinguished in the white substance of the spinal cord. These may be classed as follows:—

Astronomy - 1. Asterior or direct pyramidal tract (also termed the column of

 Attentor rationals: (as not) now (also termed asterior ground three of Photology.

Leorally- 3. Lateral or crossed portunidal tract.

4. Mreet ourbellar tract.

A. Andere laberal seconding tract of Govern (also extending forwards).

6. Lateral limiting hove.

Posterioriy—1. Postero-external (or postero-lateral) column (volume of Burdeck: pushriar realizator cons : posterior ground (form of Picchaty).

6. Petters internal (or pasters escitus) colores (colores of Gol)'s

Direct Pyramidal Tracts.—A certain proportion of the fibres of the anterior pyramids which encope decressation in the medialla, descend direct on the same side of the cord, forming the tract which more or less completely bounds the anterior median fineare. This anterior pyramidal tract progressively distintates in size from above downwards, as it becomes distributed to the anterior corns of the appearing side by a continuous decumation of its fibres throughout its course along the anterior commissure. It usually extends to the mid-dersal region, but occasionally passes slown as far as the lumbar cord, and is found to vary very considerably in size for the same levels of the cord in different insividuals, according to the store or less complete pyramidal decreasation at the lower end of the medulla. There are strong reasons for regarding the fibres of this tract as chiefly destined for the upper extremities.

Crossed or Lateral Pyramidal Tract, —Constituted by the larger proportion of fibres from the anterior pyramids? which undergo decunsation at this high level (see fig. 1, pp), the lateral tract passes down in the posterior section of the lateral columns, becoming like the anteriordirect tract, progressively diminished in size to the lowest level of the

^{*}In care exceptions even less than half the pyramidal fibers decounte at this level (Flechnig).

outh. The filter of this tract pass into the grey substance of the anterior some between the two horns, to become connected with its motor nerve cells through the intervention of their terminal arborizations. The direct and crossed pyramidal tracts represent a continuous connection with the cortex of the motor area of the beais, passing uninterruptedly in this course through the crusta of the cerebral peduncie and the internal capsule.

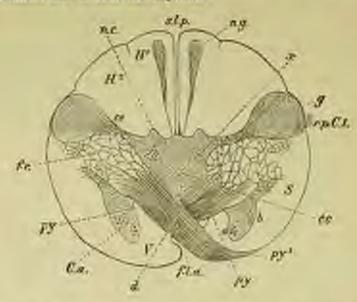


Fig. 1.—Section across transition region of medulis, slowing deciseation of perametal tract and nuclei of posterior columns.

- s.l.p., Posterior longitudinal sulcas.
- no. Nucleur fanishli gracila. n.r. Steless hasbest emeals.
- B1. Paniculus granilis.
- W. Vaniculus caneati.
- or, Neck of posterior horso, Hend of posterior bern.
- s.y. C.L. Posterior roots of first cervical BIFTER.
- z, Cell group in base of posterior virus.
- er, Central canal. S. Latinsk column.
- and & Cell rimbers in anterior cosus.
- Cu. Anterior oursu.
- pp, Pyramidal truct from Internal columns. decreasting at if an they assend.
- f.Co. Anterior longitudical funers.
- Ke. Formatio reticularen.

Posterior Median Column. This wedgeshaped column of fine nerve fibres lying on each side of the posterior median finance, scarcely recognizable below the dorsal region, extends from this site upwards to its termination in the clavate nucleus in the medalla. It increases steadily in size from below upwards, and undoubtedly receives fibers in part from the sensory serve-roots which pass into this colony by way of the postero-external column as well as the posterior commissure.

Postero-Lateral Columns cannot, like the postero-median, be regarded as largely a continuous tract throughout the spinal cord. A great part of their bulk is constituted by the inner division of the proterior nerveroots which, curving round the caput corns, run obliquely upwards or downwards, or directly outwards, to enter the grey matter of the horn; and also, in part, by a system of short, vertical, commissional fibres passing between different levels of the grey matter throughout the whole extent of the cord. Higher up in the medulis we shall find that this column terminates in the cuncate nucleus.

Direct Cerebellar Tract,—A somewhat finitened fasciculus forming the marginal zone of the lateral columns, from the end of the decad region upwards, lies upon the enter side of the lateral or crossed pyramidal tract; its fibres arise from the posterior vesicular column of Clarke, which, as we have seen above, commences at the level of the third luminar nerve. It gradually augments in size, and eventually terminates in the corebellum, passing up to it along the estiform tract of the inferior pelancis. At its origin, and high in the cervical region also, the lateral pyramidal tract becomes superficial behind, so as to separate it from the posterior cornu-

Antero-lateral Ascending Tract (Gowers). - A column of fibres extending up through the whole length of the cord (occasionally the seat of according degenerative changes) has been described by Dr. Gowers as situated in front of the crossed pyramidal and direct cerebellar tracis. The tract is regarded as a sensory tract originating from root fibres of the sensory nerves descenting across the posterior conmissure." Arising in the lumber region where it lies across the interal columns on a level with the posterior commissure, it becomes placed, higher up in the cord, more superficial. Here, in transverse section, it forms a comma-shaped tract, its head lying betwise the crossed paramidal and direct screbellar tracts, whilst its attenuated tail actends along the outer burder of the cord, almost as far as the anterior median fissure. It can be traced up into the medalla in front of the direct cerebellar truct, but where the latter unites with the rectiform body, its further course is not definitely ascertained. Some authorities (Beckterese, Bruce, and Tooth) suggest its termination in the lateral nuclei; others (Hadden and Sherrington) trace it intothe vestiform tract.

Anterior Radicular Zone and Lateral Limiting Layer.— These may be considered together as constituting, like many of the fibres of the pasterior relicular zone, a series of sheet commissional fibres uniting the grey matter at different levels. In the case of the

^{*} Diagonais of Diseases of the Spoont Cord, First Ed., 1879; and Diseases of the Nervous System, vol. 1, page 122 (General).

anterior rost come a certain portion of the fibrar decumate at the unterior commissure, and thus "a connection may be established between the two anterior corners at different break." (Generally,

We might enomarise in the following short scheme the probable relationships of these tracts, as taught as by the Wallerian degenerations following upon discuss or physiological experiment:

Short commontal vertical tracte-

- III Anterior root amen.
- (2) Laboral limiting layer.
- (3) Bardach's columns (in part).

Demonistry motor from cortex cerebri-

- (a) Türck's columns.
- (5) Crossed pyramidal tract.

Ascersing ormany Iracla-

- (iii) (iolf) relamin from pomisis roots.
- (7) Direct cerebollar from visornal tract.
- (a) Autom-lateral seconding from crossed sensory roots

THE MEDULLA OBLONGATA.

A transvener section taken just below the calamus scriptorius so as to reveal the central canal intact, ere it opens out on the free surface of the fourth ventricle, shows as the central grey matter thrust lack to the posterior margin of the section-yet excreached agen laterally by the mass of the clavate and cuneate nuclei on either side. The central grey substance situated in the middle line is symmetrically disposed around the central canal, which here forms a mere elongated slit. Most prominent in front, it presents an eminence on each side of the median raphs, with a rich nucleus of large nervo cells, really disposed in double clusters—the nuclei of origin of the hypoglosual nerve, the fibers of which conspicuously run forwards towards the olivary region. On each side of these median prominences, a lateral projection of grey matter also occurs in front of and partially surrounding a conspicuous column of medullated filees secu in transverse section encircled by medultated loops-the solitary fasciculus, fasciculus rotundus or respiratory fascicle. From this point the central grey matter inclines lackwards to the middle line, behind the central canal, and at an acute angle to the former. This sudden inclination backwards is necessitated by the provincace of the clavate nuclei, which, lying lishind the central grey salutance and to its outer side, approach such other near the mestal line; along the backward inclination of this and the interal prominence, suclei for the seigin of the accessory nerve and vago-accessory system see found. On each side of the central canal a column of filess eachoing an

elemented medicus of nerve corpuscles, measuring 23 $\mu \approx 11 \mu_0$ extends forwards towards the middle line; and here, still enclosed in the central grey area, is a mental compact cluster of small cells, The former represents the nucleus of the eminentia or fasciculus teres, which at higher levels becomes a prominent feature on the floor of the ventricle. Roat fibres of the accessory nerve will at this level be traced from the lateral angle or engineers of the grey substance to their site of emergence behind the olivary body.

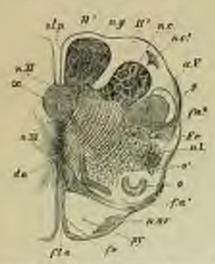


Fig. 2.—Cross-section of medula oblengata at the appeal amount ion of the pyramidal teact.

s.Ap, Posterior toughts lead ratem.

Mr. Femmes on gracifia-

e g. Nucleus of funicalus possille.

H7, Funiculus caneatus.

a.c. Nucleus of framoulus caneatus.

s.c., External nucleus of funioning ounegtmi.

e. P. Assending root of frigeration.

p. Substantia celatimosa.

f.a. f.d., f.a., External arcciores Street.

F.o. Formatio reticularia.

a l. Nucleus of lutical missus.

Accountry olive.

s. Indexion chicary body.

u.ar, Nucleus aredoreus.

pei, Princisi.

f. bet, Anterior longitudinal fleance.

st.a. Automor or imper documation of erranda.

s. YII, Nucleus and soot fibres of hypeghead serve.

co. Central canal.

w. XI, Numbers of spinal accessory.

Above the calesaus striptories, the opening up of the central caral on the floor of the fourth ventricle, is necessarily attended by a recession of the clavate nuclei ; and the eminential teretes, which, as we stated, formed the antero-lateral laundaries of the central canal, become now exposed on the surface, as the innermost column seen in this lower half of the ventricle, on either side of the median raphi. Formerly covered by the als cineres, which represents the nucleus of the vagus, the fosciculi tereter pass upwards as white columns, strongly contrasting with the grey of the vagus nucleus; and, as they take this course, they lie superjacent to the hypoglossal nuclei. These eminences, therefore, map out the course of the hypoglossal nuclei, but must not be identified with that nerve, as they belong to a wholly distinct system. Whilst the white columns of the smineatire tereses become wider and more pronounced upwards, the also cineres disappears between them and a more external eminence—the nooustic tuberele—so that transverse sections exhibit on either side of the medium raphé from within outwards the eminentim teretes, the tuberculum acousticum, and lastly the restiform columns.

At this plane the central grey matter is consequently unfolded outwards—a strongly marked concavity directed backwards, still characterises this region of the ventricle; but this process of unfolding proceeds at higher levels, until on a plane with the strike acoustices, the floor of the ventricle is almost flattened out, presenting only a gentle depression at the middle line. As this process of unfolding of the contral grey matter proceeds, the restiform tract diverges more and more from the medial line; whilst simultaneously the central grey substance, notably in the region of the hypoglossal nucleus, becomes shallower, and the nucleus itself nearer the surface.

Superficially viewed in the fresh medulia one reasily sees between the diverging restiform columns a large central V, divided midway by the vertical raphe and separated from the plump acoustic tubercles on either side by a well-marked dependion, into which the upper wedge-shaped spex of the ato cineres plunges and loses itself. The anterior burder of the grey substance has loses its abrupt prominences, and assumes a gentle situous course arrow the medulla from one solitary fuscions to the other—the several wave-like simulate representing the ane of the hypoglossal and the vagoaccessory nuclei (fig. 3).

Having so far followed the disposition of the central grey matter, from just below the opening-up of the central canal to the level of the strice mediciness of the acceptic nerve, the student aboutd now direct his attention to a cross-section of medicinated filters of a notable creacentic configuration, and ematching on its outer side a coarsely reticulated region largely made up of deep stained connective tissue. These completions structures tie laterally disposed near the tenegit, on either side, in all sections of the medicila up to the emergence of the trifacial nerve—the dark stained reticulum is the representative of the substantia gelatinosa of the posterior comm. The medicilated crescent is the accepting root of the fifth nerve, representative

the ascent of the remaining poetion of the posterior root sone of the spinal cord. Drawing an imaginary line from the solitary fasciculus tertwards to this crescent-to its anterior border in the lower levels, and to its posterior border in the higher level near the scoustic-we map off a region which corresponds to the posterior columns of the spinal cord, and their continuation as the inferior pedancies of the cerebellum: this region lies & Aind the imaginary line so drawn.

In like manner, a line drawn from the mental continuous of the central grey matter obliquely outwards to the most of the inferior olivary

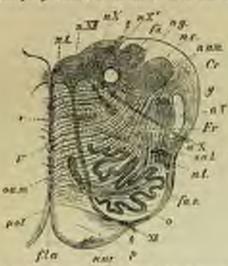


Fig. 3.—Section of controls ablougate through the inferne obview bodies.

s.t. Nucleus of fasciculus teres.

a. KH, Nucleus at hypogeomi nerve.

e. F and e. J.\ Nuclei of vague.

fa, Funiculus sulturius.

e.s. Nucleus of Innicales peachin.

s.c. Nucleus of funiculus cunsutus.

now, Nucleus ambiguot.

Gr. Bertilom teach

g. Substantia politicasa.

a. I', Ascending post of trapenious (lifth)

merriel.

F.r. Betierslarformation of Interal column - v. Median raphi-

a. I. Root fibres of vagua.

body, maps off the remaining portion of medulla into two divisions, an inner, between it and the median raphe; and an outer, between itand the former line drawn to the orescentic root of the fifth perce. The inner of the two divisions corresponds to the anterior column of the cord , the outer division, to the lateral columns. The two imaginary lines, so drawn, correspond to the direction taken by a

c.s.l. Outer aircencey afree.

ad, Nucleus of lateral columns

(s.s. External artiform tileus

u, Enfering olivary holly.

XII. Emergent root fibres of hypoglomal.

p. Autorior pyramid.

mar. Nucleus attalormis.

C.s. Anterior longitudinal favore.

p.o/, Olivary podancia,

on se, Inner accessory clive.

I's Andersor column.

motor system and a mixed motor and somery system of grantal nerves—the former line corresponding to the spinal accessory, passing gastric and glosso-pharyageal nerves, the latter to the hyperiosnal. On the other hand, the purely sensory accounts nerve arises from a position further back than the mixed lateral system; and above the plane of the latter nerve we find the origin of other counts nerves disposed in like manner—viz., an anterior or motor, a lateral or mixed system, and a posterior or sensory system.

Reverting now to the posterior of these three divisions of the medalla, which, as we have stated, is bounded in front by the emergent root fibres of the mixed lateral system of nerves-we note, first, that in the lower plane (below the calamia) the greater mass of this region is constituted by the derivatives of the posterior columns of the cord and their nuclei. The columns of Goll with their classate nuclei, and the columns of Burdach (or posterior root zones) with their cancate nuclei, encreach by their mass upon the posterior aspect of the central grey matter, nearly meeting at the middle line; and concealing, in this way, the deeper seated nuclei of origin of the vagus and hypoglossal. In front of the clavate and cuneate nuclei in the same territory, lies the solitary fascicules, and the ascending suce fibres of the fifth nerve around the gelatinous substance of Rolando. The crescentic root-area of the fifth nerve is covered caternally by the fibres of the direct cerebellar tract from the cord : whilst behind this tract, but still forming the outer margin of the modella, is a narrow namelar layer, representing the commencing restiform tract of the cerebellum

At this level it will be apparent that large numbers of delicate arched fasciculi are thrown off from both clavate and cancate nuclei ; and these, passing forwards through the lateral columns of the medulla, terminate in the inferior olivary body of their own side partially, from whence fresh fasciculi start to reach the opposite restiform tract, whilst the more posterior fascicalli cross the raphé, and traverse the opposite curary body on their way to join the restiform tract on this side. Hence the slavate and cureate audieus of each side discharges itself by an extensive series of asympte filters into the appoints remiform tract, through the intermediation of the olivary body partially of its own side, and partially through that of the other side. As a direct result of this projection, we find in our sections above the calamus, the rapid attenuation of these nuclei of the posterior columns, with a corresponding calargement of the restiform tract for the correisdiam. At these higher levels the nufolding of the central grey, matter is permitted by the lateral recession of these structures, partly induced by the attenuation and disappearance of the two nucleated masses, and partly by the divergent course assumed by the resultant

restiform trust to reach the cortex of the cerebellum and its dentate nucleus.

Near the lower angle of the fourth ventricle, our transverse sections show us the restiferm tract as a very conspicuous, conswint pyriform area, and pale-stained in contrast to the party behind it, from the close approximation of the meduliated fibres seen in cross-section, some being arranged in funciculi. Immediately behind this trust, however, is a much desperentained area, Iving between it and the central grev. matter and solitary fascionius; it is notable for the great number of small round se oval bundles by which it is constituted, measuring usually 90 a = 22 a, pule-stained, and enclosed in grey matter with a med-work of deeply stained tissue. In this area, which covers an progularly quadrilateral source, appear many large multipolar pervecorpusoles with large nuclei; these corpuscles attain the dimensions of 32 A = 20 A

The medulisted formation so constituted is an important division of the modulls to recognise. It has been long known as the inner division of the inferior cerebellar peduncle—the centiform trace. forming the outer division of the same structure. Its connections above are with two nuclei, situated one on either side of the median line, beneath the superior versiform process of the cerebellum, and are called, since their discovery by Stilling, the roof nuclei. Itsconnections below have been variously given. Stilling believed them to be the origin of the clavate and cureate columns; Meynest shows that this view is incorrect, and we have already usen that the latter columns are in complete connection with the restiferm tract. It would argear to us that these internal divisions of the cerebellar perhancle break up into accuste filosa, which partly pass behind, but partly triverse the hilm of the olivary hody of the same side, and theree, arossing the median raphé, terminate in the grey matter of the opposite olive. Nearer the calamus we find that the clavate and cureste nuclei, not as yet completely resolved into arcuate fasciculi. insinuate themselves between these two divisions of the inferior pedancie-a little higher, where the unclei have disappeared, these cerebellar columns are, as we have intimated, in juxtaposition.

Passing now to the region lying in front of the emergent root fibres. of the lateral system of nerves, between them and the motor system (hypoglessal), we find the greater part of this area occupied by the gross section of ascending fibres, broken up into numerous minute groups by the intertwining of complex arounts three, as they caree forwards and inwards to the raphe and the olivary district. this fasciculated meshwork the term reticular formation has been applied, the ascending fibres being the continuation of the outerment part of the anterior test sone. Two well-defined nuclei characterise

this lateral column of the medicial one, which is the richer is cells, as elongated and directed from without inwards, approaching the margin of the lateral column, lying parallel with the roots of the lateral mixed nerves, between the substantia gelatinous behind, and the clivary and its fillet in front.

Further inwards in this lateral column, and carried backwards parallel with the lateral mixed roots, is a second smaller group of cells more closely clustered than the former; not traversed, as these are, by dense factions of arounts filters passing to the olivary body. The former called the nucleus of the lateral column by Stilling and Clarke, night be more conveniently termed the external, and the second cluster the interval, angless of the lateral column; or following for Roos, the exterior and posterior nucleus.

They almost certainly represent motor cell-groups of the anterior comma of the spinal cord, severed from the rest of the central grey matter by the decumation of the pyramida across to the interal columns, and the interposition of the mass of the inferior olivary body. By Dr. Ross they are regarded as detached from the autorolational and postero-lateral group of cells in the autorior cornu by the cleavage effected by the arcuste fusiculi of the medulla, whilst those main groups are still found as the motor nuclei in the central grey matter of the medulla.

Interculated between the lateral columns of the medulia and the anterior or median, is the inferior allowy body, extending throughout the region we have been studying, but terminating at the level of the lowermost fibres of the pone. Prominent on the superficial aspect of the medulia, between the pyramids and the lateral and restiform tracts, it looks like a small almond shaped body, which open transverse section rereals a grey nucleus, intelled in a wedshirted investment of longitudions filters - the so called fillet or olivary fasciculus. The grey nucleus is in the form of a plicated capsule of many folds, constituted of numerous cells imhedded in grey matter, and open towards its inner side. The investing medulla of longitudinal fibres passes inwards and forms a central core for this grey capsule, the fibres of which then spread out into its various convolutionary pliestions to terminate in the cells here distributed; the remaining fibres. which do not so turn inwards to the grey capsule, pass slownwards into the lower regions of the medella and cord. We have already alluded to the dense intertwining and connections of the ceretellar arcuste fasciculi within these clivary bodies.

In the lower planes below the calamus, our sections exhibit the olivary capsule open in front at its hilus, the anterior line of plications being shorter than the posterior; and here, hordering upon this opening in the capsule, is an elongated belt of grey matter, containing cells similar to shose in the offerey body—this is the internal accessory olive. Sections taken midway through the inferior olive above us two such bodies; the one, as before, situated in the anterior column, separated from the olivary body by the root fibres of the hypoglossal, and greatly segmented by the passage of a rich system of arount offere to the raphe; the other, in the lateral column just behind the hilus, like a concave less with its concavity towards the olivary rapsule—this latter is the external accessory olive.* In histological structure both resemble the larger olivary body, and by Meynert they are regarded as continuous with its capsule.

The used coverant arouste fascionii entering the restifers teast come to it by way of the anterior pyramid and alivary body, partly in front of and partly behind and so escireling) the firmer, and ferming a thick stratum of fitters over the external aspect of the olivary body—so stratum zonale; and lastly, covering in like manner, the according rost of the fifth nerve to end in the restifers tract. A similar investment of the upper olivary body exists, as we shall see later on; this in the lower manuals is ancovered by the fibres of the poss, which do not sourced them, as in man, and constitute the so-called corpus trapezoides. The constar layer passing over the anterior aspect of the anterior pyramids is aptly referred to by Maynert as a small outerior poss.

This inferior half of the medulla, with which we have for the present concerned ourselves, contains the nucleus of origin and emergent root fibers of but one purely motor nerve-the Appoplosed-but of four of the mixed lateral system, viz., the spinal-armovery, supra, abuse pharmageal, and (the assending root of) the friforial or fifth. At the unterior nestal prominence of grey matter in these planes, we find the nuclei of the Appoplosed, which, prior to the opening up of the central canal, are arranged in a double cluster usually termed the internal and enterant convolute of the hypoglound, owing to the losp-like arrangement of the centric and peripheric three connected with them. The external also lies at a posterior plane to the internal. The cells are large and multicandate, forming the most compicuous cell-groupings in the whole sectional uses of the needalla: they measure 60 a = 20 a. The contric connections of these madei consist of certain straight fibres of the median raphé, which run backwards as far as the central grey matter, and then arching outwards, form spirals around the front and outer border of each nuclous, and are connected with its large cells: thetree, similarly curving around the inner border to pass obliquely outwards, are the peripheric fascicult -the rost-flores of the hapoplessed. These energy from between the

[&]quot;These hodies are also known at the "external and internal parelinary indica."

pyramin and the alivery body, some fasciculi traversing the latter in their course. In vertical extent this centre of origin stretches from just above the level of the decumation of the pyramids to the strice scalafferer of the accusatio nerve: but, as we distance the colourse, the groups become less definite and merged into a less characteristic form, far less risk in cells. Throughout the whole of this extent, the vertical column of cells gives origin to emergent radicles, which have anteriorly.

External to the hypoglossal nuclei lie the lateral projections of the central grey matter, in the angle of which we find the accordsized of origin of the mixed lateral system of nerves, so named from their possessing both motor and sensory filaments. Some seven roots of origin are enumerated by Meynert for this system of nerves; and it is probable that the three nerves of this system in the lower half of the medulla arise in a very similar, if not identical, manner from closely associated nuclei, some of which are common to two nerves. The two more important nuclei of origin for this system are—the motor nucleus of the mixed nerves, and the sensory already alluded to.

The motor smole are found in advance of the central grey substance. disposed in the lateral columns of the medulla. A somewhat elemented cluster of large nerve cells, from which motor fasciculiemerge and run bacheards parallel to the emergent root filters of this system of nerves, is the more important of this mode of origin; but, filtres running in the same direction can also be traced further outwards, to the nucleus of the lateral column, between the ascending mot of the fifth and the inferior olivary body. Much discrepancy appears with respect to the descriptions given to these anterior rosts of origin of the mixed lateral system ; some authorities speak of an anterior and posterior nucleus of the lateral column; others sesenile these fibres as being doubtfully room of the system; whilst others with Mornert refer to one nucleur column of origin distinct from the under of the lateral commun. In fact, Meywert traces this motor nucleus as a nucleus of the spinal accessory downwards to the laberal process of the auterior horn, and finds its analogue on higher levels in the inferior facial and motor nucleus of the trigeminal." Our own view of the case would be in accordance with that of Meynert; in addition to which, however, we would assign to the enterval madeus of the lateral column a partial site of origin for these motor youtlets. The important fact for the student to hour in mind is that these motor nuclei are, in accordance with the spinal cornual scheme, in advance of the sensory division, and reach the main scots by recurrent fascicali curving round the vagus nucleus from the inner to the outer side ; and this type is repeated for the motor roots. of the facial and trigoninal nerves.

^{*} Psychistry, translated by Suchs, part L. p. 124.

The sensory nucleus or posterior ancious for these three mixed nerves is a somewhat compact formation of nerve cells, citatered within the lateral angle of the central grey autotance at the lower planes of this region, where it forms the vago-accessory nucleus. A little difficulty may be experienced in distinguishing between the nucleus of ceigin for the three perves, if we do not attend to the fact. that so long as arounte three are seen distributed to the solitary funiculus from the raple, we are in the region of origin of the spinal accessory and below the rages' sucless; the latter centre can also be differentiated into two groups, an external and internal nucleus, described by Lickhart Clarke, a similar arrangement prevailing for the gloss-pharyngeal centres. From the apex of this grey prominence, which represents a sensory column of neigh for these nerves, pass ortwards the main root fibres-the spinal accessory between the clivary bodies and gelatinous sulatures; the vagus and glosso-planysgeal through the latter, and traversing in their course the according roots of the fifth nerve ere they emerge at the surface. Immediately cutaide the origin of this root, at the posterior or sensory nuclei, is the conspicuous cross-section of the solitary fasciculus, which really represents an ascending root for the same mixed lateral system. We have seen that a dense arounte system passes into it from the median raphe (centric fibers) below the origin of the regus, we may also just as readily trace fibres issuing from this aerending root to join the emergent roots of the accessory, vagus, and glosso-pharengeal nerves. The posterior sensory nucleus is regarded by Dr. Hoss asthe sepresentative of the vesicular columns of Clarke in the spinal cord from their relative position, connections, character of the rells, and their distribution,

A fourth rost easily traced in the region of the vagus, is one which, emerging from the rapho, traverses the front of the hypoglosual nucleus, and, following the curve of the grey substance anteriorly, enters the vagus nerve. In traversing the gelatinous substance also, the vagus and glosso-pharyngess both derive fibres from the former are they issue from the include; this is the fifth root of origin for these nerves. Another small fusciculus has been described by Clarke as passing from the fasoiculus teres into the vagus.

The Upper Half.—Passing now to the upper half of the medulia, which upon its ventricular aspect is, like the lower half, triangular in outline, its base being mapped out by the acoustic stris and its lateral boundaries formed by the superior corebellar pedundles, converging to the quadrigenism bodies, we meet first with two motor never closely associated in their origin, and arming, as do the motor central merves generally, from an anterior or median position on either side of the caphe; and one purely sensory never, which takes

in origin, in accordance with the same morphological principle allowed to, from a lateral and posterior plane. The two motor nerves are the stori and second pair, or the abducens and facial; the sensory nerve is the sightly, the acoustic or auditory. The nuclei of origin for these three nerves do not occupy the same vertical plane; that for the sixth is the highest, sext below it comes the facial nucleus,

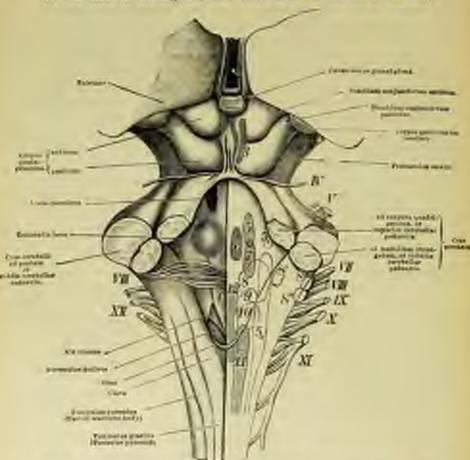


Fig. 8.—Medalla oldengata and your with unighbouring structures seen from behind schematic representation of the tracini of origin of the several passed passed.

and lowest of all the acceptic nuclei—yet they each accomively overlap the other, the internal acceptic nucleus, as we have already seen, descending also below the base of the arbitrary triangular space frawn by the strice medullares (see fig. 4, 6, 7, 8). As in the force triangular area of the grey floor below the strice, we found the nuclei of a motor (XII) and three mixed serves (IX, X, XI) associated

through a great part of their extent with the accessory body—the inferior olivary; so in this apper triangular division we find a very similarly constituted structure—the superior olivary body—compying a vertical plane corresponding very nearly to that of the two motor nerves—the sixth and seventh.

Transverse sections arrow the levels of coorgence of these latter nerves exhibit a notable change in the distribution of the various structures in front; the inferior olivary bodies have disappeared; the pyramids still maintaining their integrity as independent, compact columns, are now concealed beneath the most auterior fibres of the middle cerebellar pedancle (name), which enclose them between their transversely disposed fasciculi, as a more superficial and a deep series of fibers; whilst laterally the brachis of the poss diverge to the cerebellous, and further back the restiform and internal divisions of the inferior cerebellar pedancles in like manner pass to their disteribation. On a level with the strix modullares an intermediate transitional stage is apparent; and, as we pass to higher planes, the inferior olivary body loses its outward inclination, its long axis becoming disposed antero-postericely and immediately behind the two pyramids. Thus a lateral construction occurs which gives the medially here from before backwards an apparent but not absolute increased depth. This antero-posterior depth appears still moreexeggerated by the lower lasps of the pour capping the pyramids in front, which have just been caught at this plane and divided. In such sections the nucleus of the lateral solumn is still well seen between the diminished olivary body and the ascending root of the fifth nerve, whilst immediately posterior to the inferior olives is a group of large fusiform and multicapdate cells, the former in connection with the arcente ayatem here, the latter in apparent connection with fasciculi which pass buckwards to the median or motor column of grey matter.

Still secondar higher, the inferior cline comes, or may present its appeal extremity as a single minute plication; and, in this region, we find the prefeus of the laboral column compressed into a long narrow tract by the interposition between it and the ascending root of the fifth nerve of a very notable large uncleur of almost spherical outline, and, by the disposition of its enclosing fibres, severed apparently into a series of convolutes of large multicaudate cells. This is the anterior or inferior nucleus of the facial nerve, and from it a tomorrhat wide boilt of sparsely scattered funcicalli pass back to sacend, as we shall see later on, as the genu of the facial nerve, while the compressed nucleus of the lateral columns sends indistinctly marked fibres towards the median grey. The superior ofivery does not as yet present itself; in this plane we may study the various nuclei of origin of the amilitary nerve. Following the grey matter of the floor of the countries outwards from the median prominence (which here is semarkably shallow), we find it progressively increases in depth to its extreme laboral limits, where the lateral or sensory projection is a notable feature, and the large internal nuditory nucleus is men. Immediately outside this sensory moleus is the tensellated area characterising the inner allerings of the inferior serebellar periods; followed still further outwards by the transverse section of the crescent-like restifices treet. To the inner side of the restifirm tract the complexeous ascending root of the fifth serve is applied.

The whole of the structures above noted—the grey door with its lateral prominence, the inner pedancular trace, and the restifern column—are embraced imperficially by a soundar investment of fibres inming from the region of the raphé; in fact, the above mediallares, which, reinforced further on by others emerging from the restifern

bract, constitute the posterior root of the auditory nerve-

On the other hand, these same structures above enumerated, are embraced from within by the auterior auditory root, which runs chiefly between the restiform tract and the ascending root of the fifth, although many of its fasciesis traverse the structure of the latter. The student should remark here that the lifth ascending root serves always to distinguish to him the conergent roots of the facial from those of the couldary, the facial lying to the inner, and the sufficery to the outer side of this root.

We should therefore, regard the auditory serve as possessing two roots of seigin—(1) autorior, also called the internal, deep or vestibular root, whose peripheral destination is the semi-circular canals; and (2) the posterior, also called the external superficial or cochlear root, which is its turn ends in the cockless.

Posterior Root.—The filers from this astrone enter the unterior or accessory auditory ancieus, which forms so prominent a feature as it lies upon the deep root of the auditory nerve, and, as suggested by Brace, might much more justly be termed the auditory ganglion.

From this centre they form connections with the following atractures:-

- (a) Through the strip accession with the formatio retigularis.
- (6) With external and internal accustic muclei of some side,
- (e) With the floresless.
- (d) With reperior office of the name and appendix token by the meeting of the brapecond body.

Anterior Root. The vestibular root, continuous with the accalled ascending root of the auditory nerve, arises in part from the caneste nucleus, in part from the large cells of the external accountic or Deiter's nucleus; while a further division passes into the internal or chief nucleus of the auditory; and some fibres are traced into Bechterew's nucleus. From the internal and external acception nucleus the following connections are traced:—

- (a) With the sixth nerve sur less of the same side.
- to With the inferior ollyany of the same side.
- (c) With the florents of the same side.
- (d) With the epposite formatio reticularia.
- it: With the opposite roof made of the cerebellers.
- (f) With the opposite posterior longitudinal faminals and thus possibly with the third serve analysis.

Lastly, the caneate nucleus may bring the vestibular root intoconnection with the fillet and with both restiferas bodies (Bruce).

At higher planes of the modella wherein the superior olivary body appears, we reach the radicular across of the facial and the abducens. The motor arms of the grey story of the ventricle at these levels presents in transverse sections, two strongly defined eminences separated by the median groove and raphó—those are the eminences over the facial getts and the nucleus common to both facial and abducens nerve. The sensory arms of the grey story flanks these eminences on entire side like walls, diverging from them at a somewhat obtuse angle, the enclosed space being bridged over by the core-bellium.

On either side of the median line at the extreme posterior end of the raphe, is an oval cross-section of medulls 11 mm. by a I mm. in size, sharply defined and lying between the grey matter of the floor and the findment series of arcuste faccionly given off from the rache | it represents the root of the facial nerve in cross-section at its enevature upwards, otherwise called the facial genu. From its neighbourhood modullated fasticall aween in a wife mave following the inner margin of the grey matter as far as the sensory area, when they pain forwards and outwards to their emergence from the medalla, forming in this latter course the boundary between sensory and motor distained. In the sensory muision antable this root lies, as we before indicated, the ascending trigeminal root. The sweep of the facial in its course beneath the grey floor encloses a large and important nucleus, measuring 3 mm. in widest diameter, very rich in cells which are multicaudate, and are disposed in an almost circular aren; from the outer side of this nucleus emerge root fasciculi, which are distinctly sees to join the facial as it sweeps forwards round the nucleus to its point of emergence.

On the other hand, from the posterior and inner margin of this nuclean other fibres succepe, which upon the inner side strike forwards, becoming gradually more divergent from the raphs in sturply defined fracicalli, to leave at the lowest burder of the poss as the **abdiscens** merve or sixth pair. The nucleus itself is the abducents-facialis, also termed the posterior or superior facial nucleus, or again the nucleus of the sixth nerve. It is placed in remaministion with the cerebram by means of the fibre rects of the raphic which can be readily traced as the most posterior of the arcuste fibres energing first around the facial genu in front, and then passing round the lower homisphere of the nucleus. Considerably in front of the attacents facialis nucleus, and in the motor division of this region, lies the inferior or anterior facial nucleus, almost parallel with the trigonimal root, but separated from it by the facial energent facicalities fibres pass tackwards, as we have already seen, at lower levels to

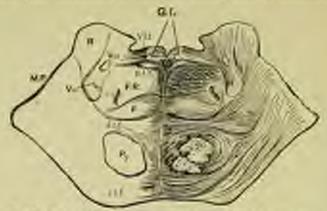


Fig. 5 - Section through post on a level with the origin of the great root of the tripeminus.

\$3.5 General beind serve:

VII, Host Sheet of famil. Fig. Mater regions of trigonisms.

Fo. Ascending root of tripensions.

E. Restiform tract.

M.P. Filmer of post-variety.

p. I.A. Pesterior Imprimitant discipation

F.P. Betirela formation

a to Superior allowey body.

F, Leuciscas or fillet.

Py. Pyranida.

AAAAAA Sepericul and day transverse. Ners of the poor.

arch beneath the abdress-facialis to its inner and posterior aspect, and thence running spectrals as the pass of the factal, again bend around its upper booker in the graceful sweep of the emergent roots.

The Superior Olivary Body,—We have seen that this body extends from the lowest border of the pass through the whele tract of origin of the facial nerve, being well-exposed in cross-rections, lying between the inferior facial nucleus and the emergent root fibers of the sixth nerve. The transversely disposed fastically lying upon its anterior surface, extending from the decumnion at the rapid to ascend in the inferior cerebellar postuncia form the so-called corpus trapezoides which becomes exposed superficially in animals where the dimensions of the peas are greatly reduced with the diminished supply of fibers reaching the medalia from the creats. The lemniscus or fillet lies in these planes to the inner side of the superior elive, forming the pale-stained area of truncated triangular outline next the rapis, the base traversed by the most posterior floricall of the peas and trapezoid formation. Into the fillet at higher planes, fibers of the upper olive pass to be connected with the central grey of the lower quadrigonisms body, the testes; functionally these fibres should be regarded as contribute, since they have been found by Flechnig to degenerate decembers's to the superior olive.

A serdefor connection is established between these badies and the roof nuclei (suclei tecti) of the middle loke of the coreballum, whilst other fibres pass back from them also to the nucleus of the sixth and of the auditory nerve, as well as to the lateral columns of the spinal cord. Motor impulses, therefore, emanate from this bady to the sixth serve nucleus, which, being connected by decreasing fibres with the sucleus of the opposite motor ocull, subserve the conjugate deviating movements of the cyclalls. In like manner, motor impulses to the lateral columns of the cord explain the associated movements of the head to the same soile.

The quadeigeninal bodies, on the other hand, which are connected with the optic tracts, transmit stimuli theree emanating, to the superior olivary bodies through the modium of the fillet, and so to the oculo-motor apparatus of the sixth and third nerves.

We have already seen that the posterior columns of the cord resolve themselves through the intermediation of their clavate and currente nucles into the restiform tract of the corebellar pedancle. They also by the anterior sensory decussation of a perion of their arcusto fascicals pass upwards on either side of the median raphé as the filles, and thence to the quadrigential bodies. This portion of the tilles, it will be observed, is a contripcted or among tract, so that the fillet really contains systems of ascending and descending fibres, as is indicated also by the results of lesions affecting the tract.

At the level of origin of the siath and seventh cranial nerves, the central grey forming the floor of the centrales is, as we have seen, extended laterally, shallow from before backwards, and bounded on either side by the restificing tracts; as we ascend to a higher plane we find the superior cerebellar pedantels on each side, which, in their descent, restrict the lateral extension of the centrale and its investing grey unintance. This occurs in such sections as are carried through the emergent roots of the lifth nerve. If we now follow the ventricle towards its upper angle, we find with the convergence of the superior pediencles towards the quadrigentical bodies, the following changes in the disposition of the central grey — First, the centricle becomes

narrower; the prominent lips of the grey matter become more pronounced, from the increase in the thickness of this formation; and at the same time the senteicle is roofed over poderisely by the anterior medullary velum. The nuclei of the fifth pair above of all the cranial nerves characterise this plane.

Higher still, we come upon the race form of the fourth nerve which decaseste scress the aqueduct posteriorly. The central grey here forms two notable protending lips on either side of the merial line, converting the squeduct into a Y-shaped figure. Progress sive thickening of the central gree substance occurs us we carry our actions through the posterior and anterior quadrigeninal bodies : the aquestict restricted in size is completely surrounded thereby, and suffers miner alterations in its outline until it opens up into the central envity of the third ventriels. From the level of the crossing of the fourth nerve upwards, the Y-slaped gray exhibits the book of the Y interposed between the two notable bumiles of the posterior longitudinal fasciculus, behind which we may contimeously follow an naturior or motor column of grey matter, containing nerve cells, and externally a bettern or sourcey column, such as characterised the cranial nerve origins in the lower half of the medelia. Betwixt these planes and the upper costs of the facial nervo he the emergent facciculi of the fifth nerve, which, in accordance with its mixed motor and sensorial function, also names a lateral site of origin. We will now take these upper ceanial nerves sevience.

The fifth or tripessized has the nucleus of origin for its motor root within the motor area of the pans somewhat similar in position to the nuclei of the lateral division, which at lower levels sent facciculi to the nuclei of the lateral division, which at lower levels sent facciculi to the nuclei system of norces—the so-called nucleus ambiguos. It, however, lies considerably behind this nucleus of the fitcisl—the asterior ficial nucleus—and cannot be mistaken for it, since it does not present the name convoluted structure; and, moreover, is not in the mid planes of section of the upper olive, although the upper end of this structure is still seen. Its centric fibres pass to it from the needing raphs where they decuesate.

The origin of the sensory root of this nerve is far more extensive. We have throughout the whole of the medulla followed up in our sections the ascending root of the trigeminal, noting how in the lower planes of the medulla the vague and glosse-pharyageal, and higher up, the focial, traversed its cross-section near their points of emergence, and now find it lying between the motor sucleus and the restiform tract in the sensory area of the poin, throwing forwards its root fibres to emerge between the transverse fascicall of the point Below, this according roof appears to end in the tubercle of Rolando, and so would seem to have a close connection with the caput coenu

posterioris. A median root is described as originating from a nucleus at the level of emergence of the sensory root in contiguity with the ascending root and the noter nucleus. On the lateral margin of the central grey around the aquelust, as high as the enterior quadrigenimal body, or mates, we find the censuscration of the descending root of the fifth nerve with very characteristic spherical or venicular cells lying in the central grey upon the inner side of the root fasciculi. Both cells and descending fasciculi become more conspicuous at lower levels, and the latter extend to the level of the exit of the sensory root, where they join it to emerge from the joint Internal to this descending root is a series of deeply pigmented nervecells, forming the substantia ferrugines, which is seen through the grey floor of the acutricle at the site named the locus cornious. From these cells, according to Meyners, pass root fibres to the opposite trigonical mot (sensory trunk), which is their course surround and tracerse the posterior longitudinal fasciculus, decumate at the posterior extremity of the raphi, and thence, following out the anterior margin of the central grey, arch into the opposite sensory rock. Associated with these latter filters are described others. which issue from the median ranké posteriorly, and after decumution. terminate in the sensory root likewise. Lastly, a cerebellar root is described by some authorities.

In the motor column of the central grey, lying immediately behind the posterior longitudinal fasciculus, on either side of the median line. and beneath the nates, is a well-defined grouping of cells, which, however, usually presents an apparent argmentation into distinct clusters. These perve cells, commencing as high up as the posterior commissure, are at first somewhat scattered, but assume a more compact form as they run backwards towards the upper half of the testes, in which region they appear lodged in a hollow of the posterior wall of the longitudinal fasticulus. This nuclear column represents the origin removes to the oculo-motor (third, and the trochlearis, (fourth) nerves; the upper, scattered, segmented portion is the nucleus of the third more especially ; the lower compact segmont bring at the junction of the two quadrigenical hadies is the nucleus of the fourth nerse. Both are believed to receive their centric fibres through the median raphe, those of the third nerve decurating ere they reach their modeus.

The segmentation of the nucleus of the motor oculi nerve has been variously described by different authorities; we follow here more strictly the account given by Bruce," which curtainly accords must

^{***}On the Separatranics of the Nucleus of the Third Cramid Norve," Alex. Brace, Free, Kop. Soc. Edit., 1882. Iditionations of the Norve Tracts of the Med and Hand Rosse, Alex. Brace, 1882.

slowely with our own observations. The whole nucleus consists of seven shief segments—a central with these lateral groups on either side, and of six minor segments, which we shall speak of as the superior, the inferior, and the external nuclei (see fig. 6).

The central or median nucleus lies along the model longitudinal phase behind the capic, and consequently in the V-shaped interval betwist the two pasterior longitudinal fasciculi. It is freely connected by commissural filters with the nucleus on either side of it, C.

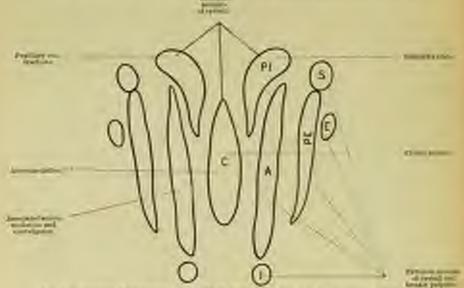


Fig. 6.—Scheme of segmentation of third narro made showing presumed anatomicia and obverselogical relationships.

J. Automor guriero; C. Central or tending nucleus; E. Kuternal anciene of Brane; I. Enterior nucleus regunent of automor); E. Superson or misleus of Durkschemitsch; P.I. Fratero internal or gale nucleus at Edinger-Westphal; P.E. Dutero-external or postero internal engines.

The anterior nuclei. On either side of the latter nucleus, and resting in the hollow of the posterior longitudinal fusciculus is an important collection of nerve cells, the longest of all the conformatic segments, and most richly supplied with commissural fibres, coupling not only these two nucleu together but also connecting them with the intervening or central nucleus, A. These two nuterior nuclei extend upwords and downwards beyond the levels of the central nucleus. The upper ends of these nuclei are but very scantily supplied with commissural fibres.

Postero-internal nuclei, also called the pale nuclei or nuclei of Edinger-Westphal, are wedged in between the central and anterior nuclei; macross below and increasing in bulk apwards they terminate in a characteristic cish-draped head above the level of the anterior segments, PL

Postero-external nuclei, also called the postero-lateral group, in still more external along the auter divisions of the posterior longitudinal fasciculus, their nerve cells resembling those of the anterior group, PE.

The six minor segments consist of—(n) a superior couple : (b) an inferior couple : and (c) an external couple.

The superior, also called the nucleus of Darkachewitsch, is placed above the upper end of the postero-external nucleus, ferming the extreme upper limit of the motor oculi nucleus, 8. Brace states that it forms the terminus for many of the fibres of the posterior commissure.

The inferior is just as clearly segmented of from the lower and of the anterior nuclei, and is distinguished from the latter by the complets absence of inter-commissional fibres, I.

The external is a group described by Brace lying upon the outer aspect of the postero-external nuclei, and of much more limited extent than the latter group, E.

All these nuclei are intimately connected with the posterior longitudinal flamoutus on the one hand, and with the root fibres of the third nerve on the other. So far as we can at present suggest the function of these several nuclei we may regard it as probable that the central subserve the function of accommunication; the postero-internal that of contraction of the iris; whilst the aniseier is the centre for the mosciated act of accommodation with convergence (Frace).

The root fibres of the third serve emerge in a series of arched fasciculi directed forwards, with their convexities, for the most part, looking towards the raphé; and in their course travers and partially encircle the red nucleus of the tegmentum which, as we shall see further on, lies on either side of the raphé above the plane of their decusantion.

The root fibres of the fourth serve take a much more circuitous course, running backwards instead of forwards to their point of emergence; an anomaly accounted for by Dr. Ross by the decussation of the upper ceretellar pedanties which occurs in the region of the testes severing the madear segment of the fourth from that of the third nerve, and so "compelling the former to seek its destination by an independent route." Commencing at the junction of the nates and testes from this compact segment, the root filtres of the fourth nerve curve around the outer case of the central grey matter to reach the auterior medullary relum, where they bossed the aquedict posteriorly. To reach this point, which like below the testes, the root fibres must necessarily have traversed the full extent of the former, passing

A I Kingmes of the Nervous System, vol. 11., pt. 44.

otinionly included and downwards to the valve of Vicussens. Crossing in the substance of this valve the fibres of opposite sides decusario, presenting another anomaly since none of the other cranial nerves except the spile tracts; decuseate on the distal or peripheral side of their united of origin, but invariably on their proximal or centric side.

THE MESENCEPHALON.

Upon the most cannal examination of the cerebro-spinal axis, one is struck forcibly by the sample arrangement and solidarity of the spinal as compared with the remaining portion or upper and of this systemthe gradual increasing complexity of the grey and meduliabed tracts of the after- and hind-brain, the so called medulia oblongata and pons, and the uniform diceryears of these tracts at higher and still higher levels; both googlisted masses and medallated systems alike severing their alliance, and diverging on either side in correspondence with the severage of the upperment system into the two great honosuberic manses. As we rise stop by step from modulls to pour, from your to corpora quadrigening, thence to the Chalante region, and lastly to the corpora strints of the prosencephalon, we find the grey manes becoming larger and more widely separated; while the medulisted tracts, in like manner, diverge and county themselves at different levels into the several ganglionic masses—in all cases, prohaldy, to take a fresh departure to their famil destination in the correlatal correst.

Leaving for the time the more consolidated tracts of the epencephalon or hind-brain, and concentrating our attention on the mid-brain—i.e., the corpora quadrigemina with the crusta and the central grey common to the whole cerebra-spinal system, we find that the crura cerebri, athwart which the quadrigemenal leaties are placed, have two distinct tracts of wholly different dentiny—the tegmentum and crusta, best seen in transverse certica.

The former occupies the posterior and inner region of the crura, and partly empties itself into the superjacent quadrigenism! bodies, and in part into the optic thalami; whereas the latter—the crusta, lying in front and to the cater side of the tegmentum—because more and more divergent from its follow of the opposite side as it courses upwards, passes in part into the basil gaughis, and in part sapands into a wide-spread fan of fibres for distribution to the extensive cortex of the cerebral hemispheses. Thus we observe that the medulated tracts of the tegmentum and crusta in turn supty themselves into the everal gaughionic masses met with from time to time—the quadrigeminal bodies, pineal gland, thalami optici, striate

CRUSTA 29

bodies, and cortex cerebri. It is important that the student understand that the termination of the fibres upwards occurs in grey masses placed at different relative levels, answering to the position of the hind-brain, the seid-brain, the inter-brain, and the fees-brain; and he should gain a clear conception of each individual tract, so far as at present known, to its terminus in a grey centre. To resurn to the mesencephalon, the hind and inner poetion of the crura forms, as we said, the tegreentum, and on this structure rest the quaingeminal bodies and thalami; on the other hand, if we follow the crusta appeards, as exposed as the Sase, we find that each creata diverges. more and more until it meets the embearing optic tracts, which at this part of the base define the boundary between mesoncephalon behind and thalamencephalon in front. At this point each create plunges deeply into the brain, disappearing between thalamus and lenticular nucleus, and passes up as a compressed medalisted tract between the basal ganglia, emerging above their level as a wide-sproud fon of three to the hemispheres. In this course, where they form a divisional wall between the large ganglia, they constitute what is called the internal capsule, the formation of which merits eartful study.

If we imagine the crusta ac seen from the base pass up unchanged in direction into the internal captule, we shall then perceive that the latter would take a direction sloping obliquely apwards and outwards. presenting two surfaces a lower, looking downwards, outwards, and backwards, roofing over the leatinglar ancieus, and corresponding and continuous with the superficial surface of the crusta as far as the poas; and an apper surface, upon which the thislamus rests, corresponding to the desper portion which lies adjacent to the tegmentum. It would also present two free borders—the internal or moral, and the external or posterior. In the further expansion of this helt of likes, the inner or medial suffers displacement through the intrusion in medial planes. of the head of the caudate nucleus, whereby the auterior portion of the capsular fibres is thrust outwards, forming a sharp bend or "knee" with the posterior division. Thus we observe that the internal capsule is a stratum of fibres with a concavity looking downwards and outwards, arching as a roof over the lenticular nucleus, and forming a medullated bed, upon the anterior segment of which rests the candate nucleus, and upon the posterior margin of which rests the thalients.

If now we examine these gangliotic masses from above, as seen within the lateral ventricles, it is evident that the long axis of each is similarly disposed—i.e., from the mestal line obliquely backwards and outwards; that the outermost of these masses, the two candate nuclei, have their large pyriform head directed anteriorly, whilst their attenuated tail-like process appears pressed outwards by the narrow anterior pole of the wedge-shaped thalami. In like manner the latter,

which have their broad extremity hinduced, are also pressed outwards belied by the intervening quadrigeminal and geniculate bedies. These these important structures—the corpora quadrigening, theleast, and similate nuclei—which represent the three

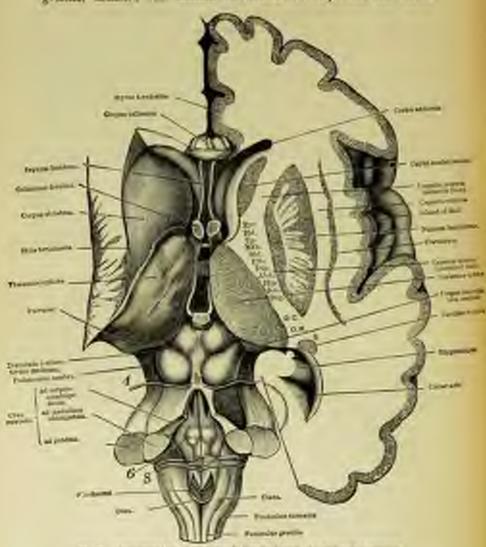


Fig. 7.—Hardwarfal section through lemispheres, the right at a desperlevel than the left.

divisions of the mesoncephalon, disnorphalon, and partly of the promocephalon, as before indicated, rest upon and surbrace the tegescatal and crustal divisions of the cerebral podusole.

On the other hand, the outer maision of the stricts body-the lenticular nucleus-has its tose directed forwards and outwards perallel with the insula, whitst its wedge-shaped ages is directed backwards and inwards towards the base-its upper surface, convex from before backwards, being adapted to the committy of the internal capenie. The poweral relationships of the internal capsule are well seen in horizontal sections carried arross the hemisphere at successively higher levels. Near the base it forms a quadrilateral section directed from within outwards and separating the tegmentum from the leaticular nucleus, having immediately behind it the locus niger, and parallel with it in front the anterior commissure as it ounce outwards through the leuticular nucleus. It will be recalled that the owner, ere it discovered into the depths of the hemisphere at the base, was bounded by the broad optic tracts; these are destined to perminate in the external geniculate body, and at a slightly higher plane these bodies appear immediately leskind the extremity of the internal suprade as seen in transverse section. At a higher level, however, above the auterice, and through the plane of the middle commissure, the anterior portion is land outwards, forming an obtuse angle or "knee," so that a horizontal section through forb humispheres at this level represents both internal capacies as an X-shaped figure with two autorice and two posterior segments (fig. 7). In the lateral angle of this X the wedge of the lenticular nucleus intinuates itself; between the anterior segments of the X the auclei candati supear; whilst the posserior organists include the optic thalami. At the central junction of these limbs, we find the fornix cet Acress.

Lastly, terring our attention again to the base of the brain, we see that the divergence of the pedincles, as they ascend, leaves between them in the middle line, first, the posterior perforated space—a bridge-like extension of grey substance at the angle between both pedancies, perforated by numerous vessels which enter the base of the thalamuse at this point; and from which white fibres emerge and source round the upper margin of the pone—the tænia pontis. In front of the perforated space are two rounded bodies—the corpora albicantia—round which the pillars of the fornix turn; and from these bedies a thin grey lanella stretches forwards as far as the optic commissure, forming the floor of the third ventricle; from its floor a hollow inte—the infundibulum—descends, to which is attached the pituitary body.

Having thus far defined the limits of crusta and internal capsule, we can the more clearly appreciate the course and distribution of their force. Since the crusta represents the continuation upwards of the pyramidal tract of the cord, it must receive a considerable seinforcement of fibers within the pass to account for the much larger size which the crusta bears to the corresponding autorior pyramid of the medulls. An examination of the pyramidal tracts and crusta in a nine months' embryo gives us most valuable information respecting the origin of the fibres faund therein. In the pyramida the outer portion of the tract consists of distinctly medullated fibres; the inner and anterior of non-medullated fibres; and an intervening portion contains a mixture of both. In the pone a similar distribution of these fibres is seen; whilst higher up still in the crusta, the non-medullated fibres occupy the inner third; the medullated fibres, the middle third; whilst the admixture of both is found behind and between the two forces. This embryological dissection maps out three distinct systems of fibres which have received the respective names of (a) the fundamental or medullated; (4) the mixed system; (c) the accessory or non-medullated system.

Still further outwards, accupying the outer fourth of the crusta, just beyond the fundamental system, are found the fibres which represent the continuation upwards to the hemispheres of the sensory columns of the cord.

If we now trace these tracts upwards into the internal caposic, we find that the accessory or innermous passes up along the anterior segment of the caposic; the mixed occupies in its ascent the anterior third of the posterior segment, the fundamental the middle third of the same segment; whilst the posterior third or outermost part of the capacite is occupied by the sensory tract of the posterior; or takulated also with reference to their distribution, thus :-

Tears.	Passes is Capera-	Es Ismussi Carsena	Contrast Tennes
January Tort.	Asserthms.	Anterior organis,	Third frontal germ penterously. At- repting frontal and parietal gere at their lower and.
Mixed Tract,	Religion Detween Accessey stall Fundamental,	Posterior regress, Automor third.	
Painlamental Tract,	Middle third,	Posterior segment, Middle third;	
Sensory Track,	Outer family,	Do., do., Posterior third.	Temporo - occipital regions.

The above table reads as follows: The accreting fixed acceptes the inner third of the crusta, passes up the anterior segment of internal capsule, and terminates in the cotten of the third frontal and lower cod of according frontal and parietal gyro—and so for the remaining fraces.

The student must bear in mind that the crust of the pedancle contains a very large system of fibres, and that the tracts above described by no means represent the whole series. Thus each crusta includes, not alone tracts of the pyramidal fibres, but the sensory tracts of the cords—fibres to the thalamus and randate nucleus, &c. The tracta we have now traced have an assessmen with the basal ganglia; they pass between the lenticular nucleus, thalamus, and candate nucleus anisterruptedly to their cortical termini. Thus, as we have seen, the pyramidal tract extends uninterruptedly between the cortex of the central gyri and their immediate neighbourhood, and the motor cells of the anterior cornun of the cord at different levels throughout its course; and this pertains both to the motor or pyramidal and to the sensory tracts. It is abrisus that the body and lower extremities have the least specialised movements, just as the arm and hand and the numeles of articulate speech are excessively specialised; and, that whereas the accessory group of fibres which supply the latter chieffe have to deal with very complex and specialisted co-ordinations, the number being very numerous, but relatively very small in size : the fundamental group which supply the large muscles of the limbs, and especially of the lower extremity, have to deal with simple massive movements, the musculature being correspondingly bulky and less specialised. We see, therefore, that the accessory group, arising from the cortex at the lower end of the central gyri, pass chiefly to the spiral levels of the face, mouth, and hands, whilst the greater bulk of the fundamental group arising at the upper end of the central gyra extend as for as the lumber enlargement for the conculature of the legs. Hence the former combitate comparatively short loops, and sample many though small muscles; the latter constitute any lengths loops, and supply the largest muscles of the frame. The latter originate in the largest zerve cells discoverable, the former or accessory in cells of greatly reduced dimensions. The fibres of the suspension columns of the cord, according to Maynert, unlarge a decusation upon a level with the decusation of the crossed pyramidal fibres. by arching forwards around the central grey column, and after decussation passing up on the outer side of the anterior paramid to the hinder third of the internal carenle, when they suddenly turn back, and are distributed to the occipital and temporo-sphenoidal lobes. As before stated, they have no connection with the thalange or loaticular nucleus. So far for the direct sensory and motor fasciculiof the crusta and internal especie. The internal especie, however, includes several other systems of fibres, of which the following are the more readily followed out :-

(a) Fibres to the cortex from the nater surface of the optic thalamus.

(b) Fibres to the cortex from the outer surface of the caudate nucleus.

(c) Fibees to the cortex from the upper and inner surface of

leaticular nucleus. (Denied by Wesnicke.)

(a) Thelands radial fibres given all from the whole length of the outer surface of the thalamus radiate forwards, outwards, and backwards; the autorior radiations towards the frontal labe; the median, entwards to the purietal; and the posterior, arching hardwards and upwards to the compital lobe. The latter or posterior is a very important formation, and is separately distinguished as the radiations of Gratiolet; it serves as the means whereby the several mets of the optic nerve, which terminate in the quadrigenizal, generalize bedies, and thalamus are connected with the occipital cortex. These optic radiations pass through the pasterior third of the internal capsule, and are consequently brought is close relationship to the sensory pedumentar tract already described as occupying this position.

(6) In like assumer, fibres endinte from the suter surface of the caudate nucleus to reach the cortex in planes internal to and above

those of the thalamus.

(c) Fibres arise from the upper and inner surface of the lenticular nucleus to interface with the fibres of the internal capsule.

(d) A system of fitters has been assumed by Flechsig to pass continuously through the red nucleus of the tegmentum and theirann into the internal capsule, to be distributed along with the fitters of the pyramidal tract to the region of the Rolandic fissure. By this means a crossed connection would be established between the central gyri and the cerebellum.

(e) Pilices from the olfactory bulb, after decusuation in the anterior commission, are also believed by Meynert to join the optic radiations of Gratioics, to be distributed to the occupital and temporo-

spheroidal cortex.

We have seen how those peduncular fibres forming the crustadiverge and enter the hemisphere as the internal uspanle, supporting upon its upper surface the caudate nucleus and thelaman, and receiving, into its concavity below, the wedge-shaped mass of the lenticular nucleus, whose ages contributes a mass of fibres to the formation of the crusts. If we now imagine a lamella of fibres spread over the broad base or outer aspect of this wedge to pass downwards beneath the lenticular nucleus towards its ages, and there meeting the crusts, whose fibres it censes transversely to its inner side, we have an arrangement which, from the insula and temporal regions of the brain, passes to the base, as a sort of sing-like loop supporting these ganglionic masses, and binding them and the prefuncion togetherSuch an arrangement is represented by the external capsule and its continuation at the base, where it is termed the ansa peduncularis of Graticlet or substantia innominata of Red; and a portion of which crossing the crusta to its inner side is named the collar, fillet, or loop of the crus.

This important formation of the unin peliuncularis consists of four systems of filters, according to the statement of Meynert. They arise from the nuder surface of the lenticular sucleus, from a ganglion lying in this position, and from the cortex of the sylvian finance, apper and temporal margin of the invels. The capaniar portion of the ama has no organic connection with the base of the lenticular wedge over which it spreads, so that it can be realily separated, and the latter expeleated by the handle of the scalpal. Its fibres, which arise from the coetex of the imula and upper margin of the sylvina fissure, necessarily pass to it through the claustral formation; and then, ferming the compact lamella of the external espenie, converge to the fasciculi at the lass of the lenticular nucleus, which we referred to us the man. At this point it is crossed superficially by the anterior commissure, which has to be removed to expose it in its entirety. The deepest layer of the ama pedancularis takes its origin from fibres issuing at the base of the lenticular nucleus -from those concentric lansille, the laminge meduliares. The fascicules completely crosses the grasts parallel to, and herediately in front of, the optic tracts, and passing to the inner or median border of the crusts, forms the innermost series of filtres, here destined to mass lack along the raphe to the central grey substance, where they terminate after demassion in the nucleus of origin of the oculo motor and trochlear nerves within the nates. The second large originating in fibres from the coetex of the upper margin of the sylvian fasters, the temporal labe and the cortex of the insula, is interrupted in an elongated ganglion at the base of the lenticular nucleus. From this ganglion fresh fibres proceed at first parallel to the course of the rest of the ansa, but then suddenly bending backwards and upwards, pursue their further course just within the grevsubstance of the third ventricle, forming the well-marked bundle of meduliated fibers known as the posterior longitudinal fasciculus. which may possibly be traced down into the spinal cord as the most pesserior of the force of the asterior column in front of the grey ecominaure of the cord.

The third layer of the anis arises from the sylvian fossa and the creter of the temporal labe, rurs parallel to the above-mentioned fusciculi at the base of the lenticular nucleus; and then turning apwards into the thalamou, forms a brust-like radiation of its fibers for back into the interior, constituting the so-called inferior peduncle of the thalaman. A fourth layer of the area which overlies the latter joins the stratum zonale, or capsular investment of the thalaman. This substantial belt of the area family binds together the region of the operculum and island to the central structures at the base of the brain, familing a complete sling around the fenticular wedge, consisting of a series of loops, the deepest of which contects the base of the fenticular body to the motor nuclei in front of the aquelluct; the others having a more lengthened course from the sortex to the anterior column of the spinal cord, or blending intimately with the structures of the optic thalams and its capsular investment.

Dissection. Place the bears with the base appearment, having carefully removed the membranes and the large vessels. Bemove with the blade a shallow harizontal dies from our of the temporo spheneidal lobes so as to pass through the book of the uncinate gyras; this lays bare the section of the pes hippocampi, and the amygdaloid nucleus. Pain the handle of the scalpel sectionly through the medaliny strands outside the per-it enters the extremity of the descending how of the lateral contricle. Carry an incision along the from in a conswhat current direction, backwards and outwards, along the whole length of the occipito temporal geri. This exposes the descending currentlessagleon its extent, and the worm-like cornu ammonis is own descending from above to terminate at the per. The tails of the candate and lenticular nuclei are now seen along the roof of the corns, and - white, glistening, surrow band of fibres curves downwards towards the amygdala—the trenia semicircularis. Upon mixing up the baser burder of the uncluste garne, we aspear the optic tracts arching backwards over the crusts, and terminiting in the two elevations of the respons geniculate, externs and interns, beyond which the pulvinar of the thalasms projects. In front of the optic tracts the crusta has disappeared in the depths of the hemisphare, and we see here the triangular floor of the anterior perforated space bounded by the delicate white roots of the olfactory serves. Deloting the optic serves backwards we expose the delicate, absent translatent grey louing forming the floor of the fifth centricle, bounded by the two white peduaties of the corpus calliagum, which at this juncture probably team across, revealing a broad white functions, the ambirior commisaure, crossing from one to the other hamisphere.

Upon gently drawing spart the divergent crars cerebri in front, a dark line is apparent, running the whole length of its mesial aspect at a greater depth than the innermost fuscicals of the crusts. This, upon dividing the crars, is seen to be the inner margin of a dark pigmented body, of lenticular section, the substantia nigra of Scenmering, which forms a distinct boundary wall betwist the crusts in front and the tegmentum behind; it extends from the berel of the corpora altocantia as far as the upper border of the pons. We shall refer more minutely to its relationships when studying transverse sections of this region. Immediately helind be the tegmentum and the large ganglia of the mid-brain or quadri-geninal bodies.

We can best study this posterior division of the meanscephalon. by first examining the external configuration and connections of these ganglia, and salmequently following the source of their fibres, and next by studying the relative position of the fasticuli as seen in transverse section at different levels. If now we so separate the oxinital labes of the hemispheres as to expose these bodies to view from above, they appear in a mid position between the two divergent coshinus of the thalamus, overriding the cerebral poduncles in the form of two pairs of tubercles an upper and a lower, each oval in form, the upper pair the larger and darker in colour, both having their long unit disposed transversely. Buth pairs of tubercles extend upwards and forwards an arm, which is really a connection for the cerebral cortex, and spreads apwards as coronal radiations; each pair in like manner arnds downwards a medallated lamella on either side of the eras cerebri-that from the rates being deeper-placed and over-hid by that from the testes; this downward extension is called the fillet of the quadrigeninal bodies, or the lemniscus. We shall trace the arms or brachia and the lemniscus at a anthoquent stage of our examination.

Between the nates, at the upper end of their median raphs, lies the constrium or pineal body (sig. 4), with its long delicate brachia extending forwards, and bounding the white ventricular surface of the thalamus above, from the median grey walls of the third contricle. Beneath and in front of the pineal body is the posterior commissure, under which we observe the opening of the aqueductus sylvil into the third contricle. Hence the quadrigenismal bodies his immediately over the continuation of the central grey autotance of the centraless sucrounding the squeduct, which would be, therefore, laid open by a certical incision carried through the median raphs of the quadrigenismal bodies. Moreover, the descending ribands called the upper and lower lumniscus are, in their descent, closely approximated to the outer wall of the central grey substance, which is, therefore, as it were, very largely enderseed by the quadrigenismal system.

Just external to the central grey substance are the various attractures entering into the formation of the tegmentum, extending as far forwards as the substantia signs. If the pedancular fibres of the crusts exposed on one side of the pans, upon removal of the arperficial layers of the middle pedancte, be divided, raised, and the deeper transverse fitten be dealt with in like manuer, we some flown upon the most anterior layers of the tegmentum, and these, when traced, are found to be the fibres of the lemniscus, which winds round from technic, and maintaining itself beneath the averlapping crusts, passes in a compact belt extending even as far as the median

raphe of the poss (fg. 5, F). In its further course it is traced downwards as the most external case of the lateral columns of the spinal coed in frost of the direct cerebellar column. Whilst the lemaisses in this part of its come gradually encloses the several other tegescatal structures, including the red nucleus, the fibres given off from the latter after decessating at the median raphe pass to the suster side of the tegescat in its further course, and eventually except from the embrace of the lemniscus about the level of the upper transvens fibres of the pons, and, becoming superficial, pass downwards to the cerebeillum as its superior polancies. We must now follow the fasciculi of the messencephalon in transvense sections taken across the upper and lower pairs of quadrigenizal bodies.

In such sections passing through the region of the nates, five structures which demand examination are exposed to view; these are in order from behind forwards—(1) The nates; (2) the central grey substance; (8) the tegmentum; (4) the substantia nigra; (0) the crusts.

(1) The Nates (Superior Bigeminal Body).-The gauglistic structure presents four distinct strata-(a) Outer grey or cortical layer of Forel. (b) Longitudinal fusciculi from the external geniculate bedy. (c) Bundles of fasciculi passing outwards on all sides from the central grey substance in delicate radiations into the substance of the ganglion. (d) The stratum of the lemniscus, embracing the grey substance, and through which the radicting fibres last named have to pass entwards. To appreciate correctly the structure of these ganglia, we must imagine a coronal fan of fibres from the cerebral cortex converging in the direction of the external geniculate bodies into the substance of the certical layer of the nates; passing back to the median raphé bebied the aqueduct, and decussating here with a similar fasticulus from the opposite hemisphere; thence arching around the central grey as the learniscus already described. The coronal fasciculus constitutes the superior brachlum of the nates; and, prior to the elemantion, it terminates in the gaughonic cells of the rates. From these cells usise the fibers which decussate, and pass us the lessniscus downwards into the spinal cord. We have, therefore, the two ganglia of the mates, so to speak, eaclosed between the upper and lower seas of a decensating modulla with an internode of ganglisade colls on the centric side of the decreasation; and the lower arms or strutum lemnisci enclosing in like number the central grey, and supporting as a girdle the mass of tegnosamus lying in front of the latter. The upper arm or brackious passes in part direct to the cortex beneath the palvinor. of the thalamus, and themes through the posterior division of the internal espeale; and in part, passes into the external geniculate hody behind and covering the former. This decusarting system of medulia extends downwards, presenting a similar formation for the testes as for the upper bigeminal body (nates). Here also we have an inferior brachlum of the testes, and an inferior lemniscus given off to the medulia and cord. As we shall see later on, an almost exact counterpart of this meduliary system carried forwards explains the formation of the posterior commissure of the third ventricle.

Both geniculate bodies receive peronel radiations, both transmit those through the beachin to the corresponding quadrigenimal body, and the external geniculate is intimately connected with the optic tract as the latter passes to the nates by the medium of the apper brackform; whilst the inferior brackform and brace the testes have likewise a connection with the inner side of the tract. Hence the nates and testes are brought into relationship with the cortex of the occipital and temporal lobes, as well as with the retina. The radiating fibres spreading from the central grey substance in the rates through the lemniscus, are probably direct connections between the serve cells of the nates and the nuclei of the oculo-motor nerves within the central grey area. In the region of the nates also we observe in cross-sections numerous bacirgli lying between the antero-lateral margin of the grey substance and the lemniscus; they pass inwards between the red nucleus and the posterior longitudinal fineignitus and decreate at the rapho-their destination being observe. By Maynert they are supposed to be connected with the nucleus of the descending root of the fifth nerve.

Red Nucleus of Tegmentum and Upper Cerebellar Peduncle. When describing the structure of the thalanus we shall find, as an important constituent, a rounded nucleur mass named the red nucleus, which upon the one hand, receives coronal radiations, and, on the other hand, gives off medallary fasticuli extending downwards through the quadrigentical region, where they decumate at the median maho to terminate as the superior pedancies of the rerebellum. The ancless itself, consisting of much grey matter enclosing large and annil nerve cells, is continued into the region of the notes, below which its grey matter disappears, and white modullary fascicali with interspersed nerve cells are alone continued downwards to the points of decassation. In the upper sectional planes (transverse) of the mesenceshalor, we are this red nurleus of almost rounded centour embraced between the solutiontic niges and commencing lemniscus (in front and laterally) and the other fassiculi of the tegment behind. At this level also the arched roots of origin of the occilo-motor nerve he on its inner side, and partly traverse its structure.

In the lower planes of the mid-brain, through the testes, the usedullary fincicalli derived from the red nucleus, now called the

superior cerebellar peduncles, approach the median caple and decusate completely with the fasciculi of the opposite side. Throughout this decumation the fasciculi are embraced between the loop of the lemniscus in front, and the posterior loogitational fasciculi behind. From the line of decusation the fasciculi now such outwards and backwards, and, still covered by the lowest fibres of the lemniscus derived from the testes, emerge apposite the greatest convexity of the point of outer the cerebellum upon the same side. If we adopt Meyner's view of the projection system, the nucleus ruber focus as internode or point of interruption between the occoral fibres of the cerebral hemisphere and the superior pedancular fibres of the opposite servicellar hemisphere; and, as with the first link of the projection system generally, the internote occurs as the same side as the hemispheres supplying the coronal attachments.

Posterior Longitudinal Fasciculus.—A compact column of large nerve libres, aval. somewhat pyriform or tenticular, according to the plane of section, presents itself unmediately in front of the central grey area, and, therefore, believe the red nucleus or its decreasing medials—the cerebellar peduncles. This very obvious comm of fibres is seen as one of the most striking features at the tegescentum throughout the mesencephalon and down the whole of the medials oblongate. We have already seen that this fincinulus originates in a compressed gaughtanic mass forming the second stratum of the area peduncularis, and that its coveral origin is from the surface of the operations, insula, and temporal toba; it is traced into the posterior fibres of the anterior columns of the spinal cord.

Substantia Nigra of Scemmering, - Another formation seen in these transverse sections is the grey matter of Sommering. It begans near the posterior plane of the corpora albicantia, and stretches downwards to the lowest limits of the mesencephalen, terminating, therefore, where the transverse fibres of the pens appear. For the greater part of its course it stretches completely across the messucephalon in an oblique direction forwards, a line which, if continued, would meet that of its fellow at an acute angle. It owes its dark colour to an abundance of large pigment cells. We shall, when referring to the thalance, find that in transverse vertical sections through the hindmost part of the third sentricle, this grey matter lies between the crusta and the red nucleus, and that a firm of coronal fibres is here. seen passing outwards beneath the thalamus to the cortex (Meysert). Pibres pass downwards and forwards from this grey left into the middle and inner divisions of the crusta, and hence this substance forms a gangion of origin for certain poetions of the centra of the serebral pedancies, and although resting close upon the tegenent beload, has no organic connection therewith.

We have thus traced the several ganglionic structures and medallary farrically entering into the formation of the measurephalon, and it remains but to summarise the results of the inquiry. The mid-beain consists of two pairs of gauglia, the quadrigenizal bodies scated upon the brain stem or pedunculus cerebri, where it diverges as two branches or crurs, uncovered by the transverse layers of the pons, and up to the point of its entrance into the base of the brain. The cerebral pedancle comints of crusta and tegment several by the intercening substantia nigra. The nates and testes have intimate connections through their brackie with the cerebral costex and retina; and below through the girdle-like iomniscus with the olivary bodies, and, according to Mernert, the lateral columns of the cord; both ganglia are also connected by their radiating central fibres with the oculo-motor nuclei in the central grey substance continued from the ventricle-In front of the ganglin and central grey substance lies the structure of the tegment, via i-The posterior longitudinal fasciculus; the superior perebellar pedangular fibres and its red nucleus of origin ; certain fasticuli crossing the median raphé from the quadrigenimal bodies | and lastly, the layer of the lemniscus. Anterior and external to the tegment, is the crusts with the substantia nigra lying behind it. In the crusts we recognise the pyramidal tract as occupying the inner, middle third, and the portion behind and between these areas, representing respectively the accessory, fundamental, and mixed tracts; whilst in the outer fourth pass the fasciculi of the sensory tract. In high planes and upon the innermost fibres, the deepest layer of the ania perincularis passes backwards to the nucleus of the ornio-motor. Lastly, the substantia nigra, peraliar to this region, represents a ganglion, from which the crusts in part arises, and which in itself is but an internode for coronal radiations.

THE THALAMENCEPHALON.

The region of the thalamencephalon is best exposed within the lateral ventrioles, for the study of its superficial parts and their relations; and, for this purpose, a dissection, such as shown in fig. 7, should be made, in which the relative position of the mesencephalon and opencephalon are equally exposed. We here see the two great gangles, the optic thalami, the pineal gland with its producele, the central grey substance (and the commissure) of the third ventricle passing downwards towards the infundibulum, and the two corpors geniculate beneath the hinder extremity of the thalamen todicating the termination of the optic tracts. These, them, form the chief structures constituting the "tween-brain" or thalamencephalon. To appreciate their mutual relationships—their centric and peripheric connections—a

careful study of accions carried through this region in three different planes is requisite—via, horizontal, longitudinal, and vertical-transverse; but a preliminary study of their more obvious external conformation is necessary ere a more minute impury is instituted. The reader should refer here to the illustration (fig. 7) given on p. 30.

The optic thalami are unnowhat oral, wedge shaped hodies, broadest behind, where they diverge from each other so as to expose the qualrizeninal bodies; and narrowed anteriorly where they approach the middle line. They are limited externally by the strin terminalis (cornea), which is also the upper and outer boundary of the thalausencrohalon-immediately external to which is the condate nycleus and its attenuated tail. In front, the thalunes presents a notable prominence, the anterior tubercle; behind, it projects back as the pulvinar, and forms in the descending been of the lateral centricle the autorior wall or roof of the corne. Meanly, the thalant are bounded by the peduncles of the pineal body; and the vertical median grey walls of the third centricle do not, as might be conjectured, represent the median aspect of the thaland, but most be carefully distinguished therefrom. In fact, the medial aspect of these grey masses is here completely concealed beneath the grey matter of the third ventricle, which is identical and continuous with the central grey substance of the cerebro-spinal tube throughout its length. To the thalams, however, belong the middle and posterior commissures which cross the rentricle, and which are really decussating meduliated tracts of the thalami-

Whilst the inner face of the thalami covered by the central grey inflatance is perpendicular, the outer presents a kind of abliquely aloping roof resting upon the fasciruli of the internal capsule; and hence the vertical transverse section of the thalams is likewise namewhat wedge-shaped in configuration. Then again it must be remembered that the thalami in lower vertebrates—bords and reptiles—are very evident projections on the upper surface of the positories nat included within the hemisphere at all; and that in man, although they appear thus to project within the rentricies and to be included within the sacre extended hemisphere, they, in reality, are satisfy the hemisphere of which the fernix constitutes the median boundary.

We have spoken of the thalamen as a source-last wedge-shaped mass, as seen in transverse vertical sections. In similar sections through both thalams, they conjointly appear like the transverse-section of a bout, keel downwards, in which the arched side rests as on a cosch in the concavity of the internal capable, whilst in the bollow of the beel the thalamen is separated from the capable by a region known as the sub-thalamic region, in which a sharply-defined, biconvex, long-shaped body is situated, to which we shall refer later on as the

sub-thalamic body (tenticular body of Meyners, or Luys' body of Forel). The anterior end of the thalamus, therefore, is placed at a considerable distance from the base of the brain and the sub-thalamic region—the mass of the serobral polancies and the intervening abbitantia nigra being immediately beneath it; whilst the whole extent of the central cavities of the third centricle and its grey walls continuous below with the infundibulum and posterior perforated space, must be excluded from the true thalamic structure.

The interior of the thalamus consists of a large mass of grey matter, sult into layers in various directions by the medallated strands possing into its structure. The grey matter encloses numerous nerve sells, which are the thalamic termini for coronal radiations connecting the must diverse regions of the curtex with this body, and the centreof origin for fresh atranda which pass down into the recessions of the crus. The arrangement of medallated and grey elements is peculial. The cortical fasciculi, as they enter the thalanus, diverge within its structure in bresh-like fashion, farming concentric lanellie, between which are interculated the layers of grey matter with their nerve cells. Since medallated fasciculi enter the thalanus from very distant regions of the cortex from the frontal, coripital, temporo-parietal grei and gyrus foreigntus-they necessarily meet at varied angles, and cross each ather in their course within the ganglion; thus it is that this holy becomes monided by its medialisey comes into apparently distinct segments-not, however, true centres or nuclei in the noral acceptation of the term, since their grey substance freely intermingles with that of neighbouring structures.

The cortical contribution to the medallisted system of the thalamas approaches that body in part at its anterior extremity by three so-called peduncles-the anterior, superior, and internal (or inferior) These thalamic pedancies connect its structure with the frontal loke, the selvian fossa, nemporal lobe, and gyrus fornicates respectively. Such cortical fasciculi have necessarily a lengthened course to pursue, and none more so than that from the gyrus fornicatus, which reaches its destruction after a peculiarly complex spiral course. The anterior polancie approaches the thalunus from the frontal cortex through the strands of the autorior arguest of the internal capcule between lenticular and constate nuclei, interlacing here with its fibers, and eventually pussing into the front end of the thalanne, expands brush-like in its interior, its fibres architer backwards, crossing the fibres of the inferior pedancle, and passing chiefly to the outside of the latter. A portion decustates at the middle and posterior commissure, whilst the rest continues directly down the tegmentum. Part of its fibres bely in the formation of the expends of the thalances or so-called stratum zonale. The inferior

peduncie, already alladed to as the third layer of the ansa pedancularis, connected with the cortex of the temporal lobe, passes from beneath the lenticular angless up into the thalamus, expanding also in trush-like manner chiefly along its internal portion, and forming the inner boundary of the thalamus. It also decusates at the middle and posterior commissure to pass down as beguestal fuscicult of the crus.

Both these peduncular expansions are interrupted by the nerve cells in the grey intercalmed layers of the thalanins ere they decusate at the commissures. The superior pedancle takes a still more complicated course; its centric connection is with the cortex of the gyrm fermeatus-spacing data in the two fimbrize or posterior pillars of the formix arising from the romu Ammenis; and ascending as the leady of the formix connected by the transverse fibres of the lyra upon the thalaman, it ambes forwards at the front end of this holy, and thence passes downwards as the two descending pillars of the forms. These latter pass back to the corpora albicastia, around which they form a distinct loop, and again turn upwards as the ascending pillars or bundles of Vice D'Aryr to terminate within and around the autorice tabercle of the thalumns. Whilst forming this loop around the corpus albicans, a pertion of its filess is interrupted by nerve cells within this body, and a fasciculus starts from this site and passes directly backwards into the tegmentum.

Whilst the frontal, invalar, and median cortex is thus connected by the thalanie pedancles to the anterior and of the gangin, the posterior or hinder half of the thalanus receives along its outer margin coronal radiations from the occipital and mid-regions of the beautaphers. These fasciculi radiate from the upper and outer border of the thalamus to corresponding regions of the brain opposite them; the middle section spreading towards the mislespons; and the postence arching backwards towards the occipatal pole. Those latter, as they pass ontwards and backwards to the occiput, are associated with similar reductions proceeding in like direction from the geniculate bodies and the brackin of the nates and testes. This system of fibres arches around the outer wall of the posterior corass of the ventricle, and has long been known as the optic maliations of Gratiolet. In their course they are brought into close association with the sensory fibres of the cord destined for the occipital and temporal lotes; and, as we have previously seen (fig. 7, 8), occupying the outer fourth of the creata-This pedancular sensory tract, it must be remembered, has no connection with the optic thalamus, but runs directly into the occipital and temporal regions of the cortex. The coronal radiations which enter this outer border of the thalamus, pass through its structure as arched feericali towards the median line-i.e., across the long axis

of the timiamus; the medalisted tracts being interculated by the grey matter common to the whole gaugilion. Upon a lower level than the entrance of these certical radiations, other medalisted faccinals pass into its substance in an identical manner from the middle root of the optic tract, and this double origin partially severs this binder region of the thalassus into an apper and a lower segment. In both systems of fibres, homispheric and retinal (shrough the optic tract), union of the fibres is effected with the cells of the grey intercalated layers

It has been shown that the peduncles-anterior and inferiorentering the anterior pole of the thalamus, run backwards through its structure as brush-like formations to terminate in cells of the grey matter are they decusate at the commissures; and that a larger proportion of these fresh fasciculi do not decussate, but pass directly downwards into the tegmentum. The latter direct fuscicali, in passing into the binder half of the tegoentum, run immediately across the axis of the optic and cortical radiations just described; and necessarily form apparent concentric dissepiments in these regions. These laminated disseptments form the new modulated tracts for the begineatom arising within the grey matter of the thalamus. The auterior pedencie especially, passing backwards through the thalemus, is not crossed by these transverse radiations, and its region is bounded on the outer side by a strongly-marked meduliated belt, the innermost of the concentric desepiments alimies to, and known as Burlach's lamina meduliaris. This well-marked boundary and absence of transverse radiating fibres, maps out a kind of nucleus in this region of the anterior pedencie, which is known as the centre median of Luya

On examining the thalamus from above, after opening up the lateral ventricles, it is found that the grey matter forming the tail of the madate nucleus may, by gentle pressure with a brush, be raised away, together with the strix corner, from the subjected parts; and, innediately beneath it, radiating fibres in course fasciculi are seen pussing from the whole extent of the upper margin of the thalanna, either directly outwards towards the parietal lobe, or arching back towards the occipital region. These fasciculi consequently form the outer wall of the lateral ventricle in their course towards the parietal lobe. If the scalpel divide these fibres across parallel to the direction of the stria cornea, the blufe passes directly into the internal capsule, and it becomes evident that the outer obliquely-placed surface of the thalamore reuts upon the internal capsule as upon a couch, and gives of from the whole of its outer aspect medullated fibess which senter into the constitution of this capenie, and then spread as cerumal radiations to the various districts of the certex of the parietal and

tempore-sphenoidal lobes. The greater bulk of these pass decely into the thalamur, and, as before said (p. 43), are crossed by the brushlike fasciculi of the thalamic polancies. The more superficial layer first revealed upon raising the tail of the candate, enters into the constitution of the white capsular investment of the thalamus (atomics counte), which gives to this gaughter its peculiar white has within the ventricle, as contrasted with the greyish aspect of the encelate nucleus.

The expenie of the thalassus spreads inwards as far as the podupole of the pineal gland ere it turns flownwards to form part of the inner investment of the dialamus; and at this line it disappears from view, and the grey matter of the third ventricle becomes apparent. This caponic or stratum nonals as steelf of complex formation i it receives also fibers from the cotic tracts, the apperment of those which join the thalansus; so also fasciculi from the frontal Jobo enter it by the anterior productle of the thalamus, and in like manner the most superficial stratum of the ausa (endicularie: batty, the gyrus fornicatus sends its contribution by means of the ascending pillar of the fornix, which in this course subtraces a nodular segmented portion of the thalangus at its anterior extremity, termed the anterior tubercle. Hence the assular layer or thalastic capsule receives fibres from almost every region of the brain-the frontal, parietal, temporo-sphenoidal, and occipital lobes, and the mestal aspect or gyrus fernicatus, as well as the retina. This very extensive retinal and hemispheric connection of the ticalmus may be thus tabulated !-

Fascicali from

Provide belog . Through natorica pediatele of thalanno.
Tempore opheroidal felos. Coronal radiations and superficial fegor of
most fretbulacie.

Parietal and recipital lobes, . Cosmal polistices along its whole center

Gyms fornicates, . . . Through pillies of foreig.

Retina, . Through apparation thelease convertion of optic tract.

The Pineal Body and its Connections,—Surrounding the upper pair of the quadrigrasinal bodies, immediately beneath the posterior extremity of the callesal commissure and in the middle line between the mesencephalen and diencephalen, lies a small, reddish, somewhat conical structure—the pineal body. It is closely attached to the velum interpositum, so that it is frequently form away with the membranes investing it. It is hollowed into several small sacculi, which contain the gritty, sorthy, and anylaceous material temporal accrulus cerebri; and the structure is possibility vacuals. In microscopic structure we find it consists, like other ganglionic atructures in the brain, of closely aggregated cells, ranying considerably in size from 0 a to 18 a.

Its connection with the rest of the cereirous is effected by means of two processes, which are directed forwards along the inner border of the thalasm optici, forming a boundary between the latter and the grey matter of the third ventricle; and descending in frost in conjunction with the tenia semicircularis and the pillar of the farmix: these are the two pedancles of the pineal body or habenula. Those pedancles are distinctly ganglionic in structure, and together with the pineal body are probably to be regarded, as Meynert believes, as ganglion of origin for the together.

The connections by medullated tracts are twofold-centric and ptripheric. The former, as a connection with the cerebral hymispheres, takes place through the medium of the stretum counte, already described as investing the outer the lesses.

The latter or peripheric connection is effected by a large and important fucicales, which passes down vertically from the intennia or pedunde, covered by the grey matter of the third ventride, and towards the region (at the base) of emergence of the motor oculi nerve on the inner side of the converging crure. In this course it describes a signoid bend, and near the base of the mesencephalon it lies between the posterior lengitudinal functions, on the median espect, and the red analysis of the representate, external to it. Some of its fibres reliate buts the suchus suber (Meynert); but the larger proportion bend at this point immediately backwards at right angles to their former course, and speece to pass into the tegmental areas of the pens and medulla, in conjunction with the posterior longitudian! fusciculus. This rectangular bend has gained for it the appellation of the fasticulus retroflexus-it is often termed the style of the peduncle of the piacal hody, where it passes vertically towards the red anciens of the tegmentum.

The atyle or functional retroglesses may be best exposed by transverse vertical sections carried through the ganglion of the pulmacie just in front of the quadrigenistal bodies, but it may also be traced in longitudinal vertical sections near the section plane of the "forces and soid brain." In these sectional planes, however, swing to its sigmoid flexure, a part only of its course one be usually seen. Thus in a vertical longitudinal section of the brain of the dog, near the mental plane, we find the lower end of this fasciculus about to bend backwards at right angles, and on this plane it is seen to descend in front of mediculated fasciculi passing downwards from the posterior commissure and the emergent roots of the third nerve. In a section carried still nearer the mental plane, we see its course about[complete, whilst a portion of both ascersling and descending pillars of the fornix is revealed likewise.

Posterior Commissure.—We have already traced the anterior and inferior pedancles of the disferent as far as their decussation in the posterior commissure, and it would seem extremely probable that the fracionius retrofices undergoes partial decussation through the medium of this commissure also. Near the medial line, we can readily trace these decussating three of the posterior commissure in their further course passing downwards into the tegmentum, where they bend backwards to pass into the medulla and spinal cord; whilst prolonged from the posterior commissure backwards is also seen the arosa section of the medullated fibres of the corpora quadrigenties.

In these vertical longitudinal sections taken near the messal plane, we therefore see three systems of decumating fascicals crossing at the middle line, and forming peripheric extensions from a series of gang-lionic bodies, via.—The fasciculus retroflexus, the mass of the posterior commissure, and the quadrigonizal fasciculi called the lemnisci or fillets of the nates and testes.

Corpora Geniculata.—Beneath the pulvinae of the thalamas in man we see a small club-almped body about the size of a ceffee-bear, directly continuous with the optic tract anteriorly, and by a netable border separating messecopisals from disdamsocolator, connected with the upper quadrigenistal body or sates. This small ganglion, for ganglionic it is in nature, is the outer geniculate body, and lies in the course of the arm of the nates or asperior brackism, with which it is intimately connected, as it proceeds to the certex of the occipital lobe. Upon vertical longitudinal section it is found to possess a peculiar physical arrangement of a mediallated and a grey lamina, exhibiting alternating layers of grey and white substance.

Internal to this body, that is, nearer the merial plane, lies another small attracture of spindle-shaped outline, immediately beneath the upper and between it and the lower brackinm; it is directed towards the nates by one of its pointed extremities. This structure is the inner geniculate body. Both geniculate bodies are connected with the corpora quadrigenism on the one hand, and with the cortex of the scenpital lobe along with the other centric fusciculi of the brachia. In a vertical section we find an extensive portion of the optic tract directly continuous with this plicated outer geniculate gaughies, and hence also with the inter. An inner segment of the optic tract, but much more limited in extent, passes into the internal geniculate and thence to the sates also; no fibres from the optic nerve are believed to pass by this tract to the rester.

The remaining connections of the optic tract are the optic thalassus (to the structure could and radiating facciculi previously described); and the basak optic ganglion, a small body of grey matter lying beside the later converses introductely covered by the optic consciouse: The gaugin of origin of the optic nerves, therefore, are the upper quadrigranizal, the outer and inner geniculate bodies, the optic thalamus, and the basal optic genglion: the centric or coronal extensions arising in these gaughs pass by means of the posterior section of the internal capsule as the optic radiations of Gratiolet to the certex of the occipital and (i) tempore sphenoidal lobes.

PROSENCEPHALON OR FORE-BRAIN.

Configuration.-We have already seen that divergence of the brain-stem in the crura cerebri to reach either hemisphere, entails also the more and more complete asserance of the various gauglistic masses at the base with which it is brought into connection; and that from the hilateral fusion of the mesencephalen, we puts forward to the divergent masses of the thalami (diencephalon), and thence to the still further severed corpora striats, constituting the ranglis of the fore-brain (prosencephalon). We have seen how these more divergent masses are braced together by sling-like losses of modella, such as the ansa lenticularie, and united mentally by the autorior and other commissional tracts. The gaugins of the processephalon form the most anterior mass of grey matter surrounding the peduacular extensions, and are so disposed as to constitute two incompletely sovered muses of grey substance, whose configuration sladows forth the form assumed by the bemispheric envelope moulded around them. The flexure of the fore-brain, whereby this hemispheric are reproduces the contour of these gauglionic structures, has its site at the fissure of Sylvius; and, in fortal brains, ere the further differentiation of the cortex into its varied longitudinal and transverse fissures has proceeded, we see readily how the hamispheres see, so to speak, ascalded after the form of their subjectnt gauglia. The axis of this flexure is constituted by the most external of these ganglionic masses, the so-called lenticular nucleus, wedge-shaped in form, its base directed forwards and outwards, covered by the cortex of the insula-its spex downwards and inwards towards the crus cerebri. Around this wedge-shaped axis, the ganglionic and hemispheric area are severally formed—the ganglionic, in the form of the capitate nucleus; the hemispheric, beginning at the orbital aspect of the frontal, aweops round the fronto-parietal to the tip of the temporo-sphenoidal labe. The more flattened aspect of the region of the insula, therefore, bears the improve of the base of this lenticular axis of revolution whilst the more spheroidal contour of the hemisphere conforms to the curvature of the caudate body.

Upon this constructive principle largely depends the divergence observed in the primitive contour of the construm in various animals and in man. Although identical in the nature of their histological constituents, these two ganglionic masses differ widely, not alone in their rough contour, but in their quantitative relationships: in certain brains, the caudate ancieus assumes a mass far out of all proportion to the leaticular; whilst in man, the former is dwarfed, and the latter assumes a relatively important elfe. The greater magnitude assumed by this lenticular axis of revolution, the greater the scope for the unfolding of the hemispheric are, and the more important the developmental features assumed by the regions of the incula and sylvian

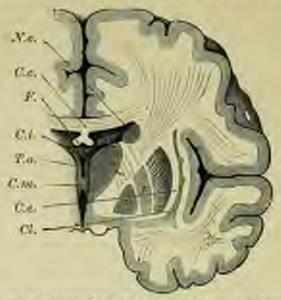


Fig. 8.—Section through hexapheres (vertical transverse) through plane of middle community,

N.c. Tail of cambate medeen,

C.c. Corpus vallossess.

P. Fornix and churud plexus.

C.6, Internal expense.

T.o. Optic thalassus.

Co., Middle commissioner.

Ce, External coprote.

Cl. Classtron.

7, 2, 3. Three segments of lectionies

Sours. On the other hand, the smaller lenticular body, and the larger proportionate development of the envolute bespeak a beain of simple configuration, more spherical, less complex in convolutionary arrangement, and of more uniform symmetry throughout.

In this indicating their impress in the configuration of the cerebral vault, these striate ganglia differ widely from the diencephalic ganglia previously considered, the thalami optici; in fact, these latter bodies, so far from having any portion of the cerebral hemisphere moulded to their form, are themselves wholly outside the corebral envelope in their mental position. Thus, the adult beain witnesses to the genetic relationship of the cerebral benispheres, and the related striate ganglis; the whole mass in front constituting the fore-brain or presencephalon in solvance of the thalamencephalon.

We have spoken of these hami ganglia as incompletely severed masses of grey matter, a statement at once scrifted by vertical sections taken in anterior planes through these bodies. In such anterior planes, the medullated interval elsewhere separating these bodies is bridged by numerous broad hands of grey substance which are but extensions from one to the other ganglion; whilst, at the base, complete fusion occurs between the two, the head of the candate nucleus saveging into the frontal extension of the lenticular, becoming so superficial at the base as to be merely covered over by the orbital medulla and the grey matter of the anterior perforated space with which it becomes continuous.

Caudate Nucleus, -The innoment or intraventricular nucleus of the ganglion of the fore-brain, and the only portion emericially seen within the lateral ventricles, is of pyriform shape, with a long attenuated tail-like process extending into the temporal lobe. In this course, as before explained, it is bent upon itself, its axis of revolution being the lenticular body. The head of the ganglion fesion at the bare with the lenticular, arches forwards and bewards towards the septum lucidum, and, lying on the inner aspect of the internal capsule, embraces, in this first part of its course, as important medulisted fasciculus, which connects the cortex of the frantal lobe with the saterior extremity of the optic thalamus, the so-called anterior thalamic peduncie. In its further course, it ascends above the level of the lenticular, and lies upon the internal capsule; its tail-like extension resting, opposite the thalamus, upon the heroispheris flores which pass beneath it, to form the capsular investment. of the thalannys (steatess rough). Still further back, the tall arches downwards into the descending hora of the ventricle, and can be traced upon the roof of the latter as far forwards as its autorior. extremity, where it terminates in a somewhat beloous end, having immediately in front of it a mass of grey matter, termed the amygdala. It will be seen from this description that the bulbons extremity of the tail extends almost as far forwards as the boad of the caudate nucleus, and thus describes an almost complete loop around the internal capsule and thalamus, honce termed the "surgingle," The whole course of this loop can be well demonstrated by vertical longitudinal aections of the hemisphere; whilst vertical transverse sections anywhere between the amygdala and posterior and of thalamus reveal the upper and lower segments of the surcingle, as isolated grey masser above and below the thalamus. Each of these prosencephalic

ganglia has a surface perfectly free, that is, devoid of medulisted attachments-and other aspects, which present the termini of centric and peripheric strands. Thus, the ventricular aspect of the condute, together with the base of the lenticular wedge (insular aspect), are alike smooth and devoid of medulisted connections; whilst the coposed surfaces, separated by the intervening capsular fibers, as well as the basal or inferior aspect of the lenticular nucleus, are the surfaces for the termination and departure of the numerous medallated connections of this with distant regions. Since the festicular body lies bework the internal capsule, its temporal extremity is separated for some distance by that formation from the temporal extremity or cousts of the intraventeicular nucleus. Posteriorly, however, they approach each other, and bridges of grey matter connect. them, separated by medulls. They are also separated here by the centric extension (brackium) from the enternal geniculate body; and, finally, along the roof of the descending comm these two temporal extremities fase together, farming the lower segment of the surringle.

The constitution of the survingle, therefore, is different in its upper and lower are, being purely an extension of the innermost nucleus above; but formed out of the fused temporal extremities of both prosencephalic nuclei below. It cannot fail to impress the student that the ganglionic structures and their extensions, so far described, ensirely in a series of loop-like formations the meduliated core which passes from the spinal cord and medulia apwards as pedancies and capsule to the cerebral hemispheres.

First, there is the mesencephalon, the quadrigeninal bodies, each throwing downward its loop-like Allet or fesseless, and throwing upwards its contric arm in the form of the brackie. At a higher level, the thalamencephalon shows as the optic thalaman saterife the posterior edge of the internal capsule, seeking backwards around it to form the roof of the descending hoen of the lateral ventricle; whilst its centric extensions pass apwards to the cortex from its outer surface beneath the tail of the caudate. Then still higher we get the are of the caudate body astride the anterior edge of the internal especie with its long tail-like loop also passing down the roof of the descending corne in conjunction with that of the lenticular: whilst still further outwards is the mass of the internal capsule becoming free as coronal radiations to the various parts of the hemisphere. For descriptive purposes it is convenient to distinguish between upper or ventricular, and lower, cornual or temporal are of the meniagle, the caudal extremity, the body of the caudate nucleus, and its caput directed towards the base, whilst we also speak of its ventricular and cansular aspects.

In like manner the lenticular nucleus has its frontal, its temporal,

and pedenceller or crustal extremity; its insular aspect (or base of wedge), its inferior aspect, its capsular aspect. So also the capsular constituents may also bear the convenient terminology—corticostriate and cortico-lenticular faccionii for the centric bundles; pedunculo-striate and pedunculo-ventricular for the peripheric bundles; direct peduncular for those uninterrupted by the prosencephalic ganglia.

Stria Terminalis.-A glistening white band of fibres, strongly contrasting with the adjacent grey cands, varying from one to two millimetres in dismeter, lies along the inner border of the tail of the candate hody throughout its whole length, extending from the tip of the temporo-sphenoidal lobe along the roof of the descending cornu, and along the upper are of the survingle betwint it and the timiamon, as far as the anterior end of the latter. Inferiorly it is distributed to the amygdaloid nucleus; and by Meynert is regarded as arising from the head of the caudate nucleus. Schwalbe, on the other hand, regards this conclusion as dishious, and expresses the opinion that it possibly has no connection whatever with the ganglion. By other authorities-Meckel, Arnold, Jung, and Luys-this areiform land has been presumed to terminate in the descending pillar of the Araiz. This lengthened arciform structure, which has been also called the teenin semicircularis, would appear from its greater proportionate development to be an important structure in the besin. of redents; in the dog, on the other hand, it is comparatively insignificust in size. In the rabbit in can be clearly seen to comist of a esperticial and deeper fasciculus at its termination, and to be connected throughout its course with the enadate nucleus; the latter serkes downwards behind the anterior commissure just to the inside of the lower margin of the internal capsule, as seen in vertical sections : these fibres appear to terminate in the area at the base known as Gratiolet's olfactory area-embraced, in fact, within the trigonum olfactorium. It would be hazardous to affirm that none of the superficial fibres enter the descending pillar of the fornix, as stated by several authorities; but in the rodent it appears easily demonstrable that this fracicults, in great part at least, enters the anterior comsuissure from behind in such a direction as to ensure decasoation, and so bring the hippocampal region and candate nucleus into crossed relationship with the olfactory bulh." We shall refer to this connection further on when dealing with the relationships of the anterior commission.

Lenticular Nucleus. Although in section both vertical and horizontal, this ganglion exhibits a distinctly wedge-shaped contour, its

[&]quot;Not "Comparative Structure of the Brain in Roderin," by the Author, in the Philosophical Transactions, part it., 1882, p. 726

name of festicular is justified upon inspection of its outer or insular aspect. This can only be done by freeing it of its medallated connections—an operation readily effected either by dissection or the brush, the ganglia being held beneath water, whilst the medullated investments are dissected off or brushed away. In this manner it is easy to isolate the two ganglia of the prosencephalon attached to each other, for the purpose of ecognising their fundamental configuration.

The lenticular, then, appears to be a distinctly lensalaped body, especially if looked at from above, where a section of the internal capsule at the foot of the corona radiata separates it from the caudate nucleus within. It will then also be apparent that the caudate, applied at faut to the inner side of the internal capsule and lonticular, arounts higher and higher so us to lie with its attenuated tail upon the former and above the latter. The smooth lens shaped exterior of this structure is overlaid by a meduliated investment—the external capsule, loosely applied to it, occasionally the site of hawoverhaps, which breaking into the intervening tract, separates it from the surface of the lenticular.

External to this capsule comes the claustrum, and, lastly, the medulla and coress of the insula or island of Rell. Upon section this ganglionic body shows a well-defined triple segmentation-distinguished by the grey aspect of the outer, and the increasing pallor and tawny pigmented aspect of the more internal segments; the innermost and largest which is natably pule and pigmented being designated the globus pallidus (fig. 8). These three divisions are not merely distinguished by their difference in colour, but are separated by wellmarked dissepiments called laming medullares, which, as this medallated partitions, descend from the internal capsule down to the basal aspect of the brain, lying concentrically to the insular aspect of the ganglion; two and sometimes three such dissepiments exist. The meduliated fibres forming these discepiments, and arising from the internal capsule, bend inwards at different points to form radial fibres, all directed towards the pedancular and of the wedge; a certain proportion, however, completely traverse the lenticular as lamine medullares; and, escaping at the base of the gauglion, pursue their course towards the crusta, as a sort of capsular aling, covering the base of the lenticular and forming one layer of the so-called ones featicularie already referred to. Since each segment is traversed not only by fibres originating in the cells of its territory, but also receives those passing into it from an outer asgment and its medullary lamins, it follows that the narrow or peduncular end of the wedge becomes constituted by a closely parked system of medicilated fibres. where they enter the crus cerebri; and it is this prepanderance of fibre over grey matter which gives to the inner segment (globes pallidus) its characteristic paller.

THE ENCEPHALON AS A WHOLE.

Comparative and Embryological, —The earliest indication of a brain in the vertebrate series consists in a slight bulk-like dilutation at the end of the neural tube. This is all that ever occurs in the lowest form of vertebrate assimula—the amphioxus or lancelet, which therefore presents as a permanent structure the earliest, but transitory, thase of development, through which all higher vertebrate pass, even to man himself. A step higher, the lamprey exhibits a large pyriform dilutation of the neural tube, and retains for a long period this rudimentary form, which, however, in comparison with its spinal system, bears to it accordy a higher proportionate size than do the cephalic ganglia of insects to their ventral ganglia.

Still higher in the vertebrate series, in fishes and amphibia, we find that this bull-like distension of the neural axis becomes very early transformed by transverse constrictions of the former elongated bulb, into a series of five pairs of vencies, which lie in linear series, one behind the other, and which are reproduced in every form of vertebrate, higher in the series, at a certain stage of its developmental history. These five vencies represent what in higher animals become respectively the fore-brain or cerebrum, the twixt-brain, the mid-brain, the hind-brain, and the after-brain.

These several parts in tishes and suphibia represent elements of the higher vertebrate brain, which remain permanent in them, but subject to most diverse modifications in structural complexity and in relative preparaterance of one or other segment. The fully developed brain in fishes presents great variety in the relative size of the individual lotes. In the first place, the early differentiation between the vericle of the twist-brain and mid-brain becomes obscured in most fishes, so that the fully formed organ shows us but four gaughated swellings, lying one behind the other in series, and representing (1) the cerebral hemispheres; (2) the optic lobes; (3) the cerebellum; (4) the medulla.

The two former, as seen in the brain of the perch, are disposed in pairs, whilst in front of the cerebral hemispheres we see yet two small bulbous aveilings, from which arise the olfactory nerves, and which are called, therefore, the olfactory ganglia. These ganglia are absent in the Shark, Shate, Whiting, &c., and are replaced by an elongated peduncle capped at the extremity by the ganglia as in man.

The cerebral benispheres in fishes are usually smaller than the optic lobes—e.g., in the Whiting, Carp, Pike, Perel; but in the Shark, the Ekste, the Lepidosiren, and others, they very greatly exceed these lobes in their dimensions. Behind the cerebral hemispheres appear the optic lobes, which in the fish, is must be remembered, represent the thalamencephalon (thalames and third ventricle) as well as the

mesencephalon (or in man what corresponds to the corpora quadrigenina). Thus, if we turn to the brain of the perch, we see in front
the two small offactory lobes, followed by a large pair of corebral
hemispheres, and these in their turn by the still larger pair of optic
gaughts, with a small tubercle projecting in front between them and
the cerebrum. This latter body is the pineal gland, indicating the
neighbourhood of the thalamencephalon, with which it is connected.
At the base the same structures are seen in front; but the optic lobes
present two peculiar lobulated bodies called hypogria or the lobi
inferiores, whose significance is unknown: they are peculiar to fishes.
From the centre projects the pituitary body, whilst the optic norves
are seen to originate from the base of this gaughter, and cross (without
documation of fibres) to the opposite sides. In Insects these optic
lobes represent the chief part of their cephalic gaughts.

Behind the optic lobes comes a single tongue-like lobe—the cerebellum—the size of which apparently bears a direct velation to the power and muscular activity of the fish. Thus the reparious shark has an enormous cerebellum, whilst in the more sluggish fish, it is relatively small; in onecous fishes it is usually considerably below the size of the optic lobes. The last division of the brain is the medulla, lying immediately behind and beneath the cerebellum, supped off from the spinal cord by its somewhat larger size, and the origin of numerous important nerves.

In amphibia, the brain presents a smaller cerebellism than in fishes, corresponding with their more torqui habit.

The reptilian brain differs from that of fishes, shiefly in the smaller relative size of the optic and olfactory lobes and cerebellum—the latter being often a serie delicate transverse hand across the apper part of the medulia; and in the relatively large size of the cerebral hemispheres, which partly overlap the optic lobes and exhibit a distinct striate looky. The cerebellum is especially large in the crocodile. The hemispheres are connected as in fishes by an autorior commissure.

In birds, the cerebral hemispheres exhibit a great developmental advance. They are very large, and cover more or less completely the optic lobes. The cerebram contains a distinct cavity, corresponding to the lateral ventricles, and communicating with the hollow peduncle of a small olfactory lobe in front. From the floor is developed a ganglisted mass—the corpus striatum. The optic lobes (corpora bigomina) are two smooth, rounded, egg-like bodies, just apparent from beneath and behind the hemispheres; widely separated, but communicating through a hollow passage which also leads into a channel between the third and fourth ventricles. From below we see the optic nerves arise and distinctly decreases the middle line.

The cerebellum is also of large size, but chiefly consists of the middle jobs.

The germinal area of the mammalian avain reveals at an early stage the medullary groove, as a insgitudinal and gradually deepening channel in the fore-part of this area-at first of uniform diameter throughout, but soon becoming widest at one end-the copinsic. The groom itself results from the thickening of the outer germ layer or epiblest in two parallel linear streaks, corresponding in direction to the long axis of the embeyo. The thickening of these parallel ridges proceeds until the groove thus produced is covered in by the bending across and coalescence of these its walls-the so-called medullary folds. Thus, the medulisry groove becomes converted into the closed canal destined to become the cerebrospinal ravity, and now termed the neural canal. At its fore end, this canal is dilated into a bulb or vericle—the primary cerebral vesicle; whilst shortly afterwards two other vesicles, separated by constructions of the neural canal, form along this end of the canal impediately behind the first vesicle. These three vesicles, placed one behind the other, lie in a straight line with the axis of the neural canal, and are termed respectively the vesteles of the fore-brain, the mid-brain, and the hind-brain,

Vesicles of the Fore-brain, - Form the first of these, a lateral buiging an either side becomes soon argurest, and, steadily increasing, is at last merely connected with the former by a merow countricting neck or tubular stalk. These give origin to the more important structures of the eye and are termed the optic vesicles. By an exactly similar process, two other lateral bulgings from the fore-partof the first cerebral vesicle become differentiated therefron; and these are destined by rapid growth and development to become the most suportant and completous parts of the cranial contents. They form the cerebral hemispheres or prosencephalon. At the second santh of intra-sterine life, they are more insignificant ampalla, of sumewhat oblong form; but even now presenting a short tubular extension from their tip, which is the rudiment of the olfactory lobe. The remaining portion of the primary vesicle in its median position enters into the constitution of the parts around the third yentricle, It has consequently been named the vesicle of the third ventricle, or the tween-brain, or from giving origin to the optic thalami-the thalamencephalon. Hence the two point of vesseles, the optic and hemispheric, have their genetic origin from the thalancencephalon, and a direct connection between these structures is maintained during all later stages of development. The cerebral hemispheres, as of shoots from the primary cerebral vesicle, are hollow rencles, communicating with each other and with the savity of their parent vesicle, the third ventricle, by means of the foramen of Monro. As the walls of the

hemispheric vesicle gain in thickness, its cavity becomes of course more and more encesached upon; yet, for a long period during uterior life, the growth of this vesicle is so rapid that its cavity is of great size; this cavity forms therefore a relatively capacious ventricle-the fateral contricts. In the outer and lower wall of the hemispheres thickening proceeds to the extent of forming a large ganglionic mass, the corpora arcists or ganglia of the fore-brain. These ganglia, it is to be noted, are not directly derived from the primal neural take, but from an effshoot of the latter—the hemispheric reside. The posterior moiety of the first cerebral vesicle in like manner exhibits a thickening of its walls, which form the ganglionic mass of the optic thalami, connected behind by the posterior commissure, just above which a small median projection forms - the pineal gloud; its floor upon the other hand, sends downwards a conical projection—the infamiliarius, which, later on, unites with the hypophysis cerebri or pituitary body, immediately over the pharsux or extreme end of the alimentary canal. The funnel-shaped extension of the third ventriele is by some regarded as the representative of the neuro-enteric canal, which establishes connection directly between the cerebral and caudal extremities of the alimentary canal and the central canal of the cerebro-spinal system. The upper part or roof of the thalamencephalon becomes thinned out into a mere lamella of pia mater, covering the third ventricle as the volum interpositum.

The second cerebral vesicle or mid-brain calcibits no such building off of secondary parts as does the primary vesicle; its upper hemisphere becoming thickened, ultimately forms the quadrigenisal bodies; its lower hemisphere or floor in like manner develops into the crure cerebri or cerebral pediancles; whilst the central cavity thus encroached upon becomes eventually reduced to an exceedingly narrow channel, continuous in front with the third ventricle, and behind with the hollow of the third cerebral vesicle—this shannel is the agicies appealant or site a tertio of quantum restriculous. The ganglia of the mesomrephalon or corpora quadrigenina are not completely differentiated until the sixth or seventh mouth of intra-aterine life. At the sixth mouth, a vertical groove severe the vesicle into lateral pairs; at the seventh mouth, a transverse groote separates the upper pair or notes from the lower pair or testes.

The third cerebral vesicle or hind-brain becomes differentiated into two segments—an apper, immediately behind the corpora quadri-gemina, from which is derived the cerebellism, pous, and upper part of the fourth ventricle; and a lower, forming the lower half of the fourth ventricle and needulla obtougate. The roof of this lower segment thins away to such a degree that, like the velous interposition, it also becomes a more numbering closing in the ventricle at this site. The

upper segment is termed from the cerebellum the hind-brain or epencephalon, the lower segment the after-brain or metencephalon.

The Cranial Flexures.—At a very early date, the first cerebral vesicle begins to curve downwards around the extreme end of the notochord, until, from being in a line with the latter and longitudinal axis of the embryo, it becomes placed vertically at right angles to this axis. An angle or bend thus occurs between it and the middle vesicle, which, in its turn, becomes most provinest and in a line with the notochord. A second bend in consequence of this flexure also occurs between the middle and the posterior vesicle, or that portion of it which becomes the cerebellum; a third takes place between the latter and the binder half of this vesicle, which becomes the medulia oblongata; and yet another between this region and the commencement of the Spinal Cord. These cranial flexures, which occur between the first perceival vesicle and its derivatives, the Quadrigenimal bodies, the Corebellum, the Medulia oblongata, and the Cord, are stated by Tedermans to take place about the seventh week.

In the further process of development the cerebral hemispheresof prosencephalon enlarge wholly out of all proportion to the hinder jects of the neural tube, so that the quadrigenizal bodies which hitherto, as in animals, have had a relatively large bulk compared with the cerebrum, become now placed quite in the shade beside the rapid advance made by the corebral hemispheres. They extend upwards and backwards, covering and concenting the thalamns by the third month, the corpora quadrigemina by the sigh month, and the cerebellow by the securit mouth of intra-sterine life. Long prior to these last changes in fact, about the fourth wouth, a slight depression appearing on the outer aspect of each hemisphore midway between its naterior. and posterior extremity, indicates the position of the syrvies from ; and were a horizontal section of the hearisphere extried through this depression we should find the walls of the vericle within much thickened at this point, the thickened mass protrading into the central eavity as the redimentary stricte ganglia. This foom, which is seen early in all mammalian brains, becomes the insula, island of Reil, or central lobe, whilst the cortical structure, thickening around it, forms a distinct fasure, the sylvian fissure, whose upper and lower margins encroach upon and cover the "island" from view. Up to the fifth month, however, the favore of Splvine remains patent. expening the island to view. The finures of Rolando often appear about the end of the fifth month, whilst together with the forumes of the frontal lobe, they are prominent objects on the auritor of the hemisphere at the termination of the sixth month of uterine existence. About the same time also appears the internal parieto occipital figure

on the inner aspect of the hamisphere, mapping off the recipital from the parietal lobe on its median aspect. This figure in its descent secent the hippocampal figure at the point where its posterior extension forms the so-called calcarine figure.

THE CEREBRAL CORTEX.

The fundamental divisions of the exceptation, or brain, in mammala are identical with these existing in the whole vertebrate series of skulled animals (Crassiota). The early history of embryonal existence is alike for all-each animal higher in the scale, even the highest - man, reproducing at an early period of embryonic development, as a transient condition, the Seatures permanently stamped in those of a lower grade. The infinite degree of complexity ultimately obtained by the mammal's brain is prefigured by the force assumed in the lower classes. of vertebrata, and depends, for the most part, upon the preponderance of certain divisions of the emophalic mass over others, and also upon the growing complexity of individual parts, either as the result of increasing differentiation of existing structures or the addition of supplemental parts in the form of gangliated masses or fibrous tracts. In the mammal's brain we find the first condition exemplified in the complicated convolutionary surfaces of the cerebrum; in its division. into lobes and lobules; in the wendrous complex structure of its cortex. We find the swood exemplified by certain ganglionic outgrowths from the original brain-vesicles, and along its fibrous tracts in the large striate and thalamic ganglia, in the featicular hody, the optic hasal ganglian the corpora geniculats, and others; and vet again in the extreme development of the callocal and other connecting asstrace of the brain-mass. The endless diversity of righly-convoluted leains. in mammals introduces no feeling but that of confusion to the mind of one who has not studied the cerebrum in its various forms as presented by the whole range of manufaction anomals; in fact, a comparative investigation can alone teach the student the significance of its complicated mantle, and help hise towards recognising acmologous rarts in the series.

Great advance has been made towards this end by the labours of Gratiolet. Ecker, Turner, Breen, Huxley, who, amongst other valuable results, have introduced a definite nonemelature which reduces to precise terms, universally intelligible, the statements of different workers in this department. Another field of enquiry has added rich results in the same direction—the physiological. From that epoch in the historical development of Nervous Physiology when it was discovered that the cerebral cortex was excitable to electric atimali, with patient toil have questions been put and answers received by this method of research, and a mapping out of the complicated

Seids of the coetex into physiological territories established by Ferrier, Hitsig, Horsley, and others. Another field of exquiry has received but scant attention, yet it is one which an accurate effectific knowledge of the cortex must make its swn: I refer to the histological structure of the whole cerebral mantle in its various districts, as supplemental to the coarses examination of its medallated trarts by the clearage methods of Gratiolet, &c. It is but a natural o priori conclusion that differentiation in cerebral feaction implies likewise a structure of differentiation, and that this latter is one of qualitative as well as quantitative value. We insturally look for an alteration of structure as well as disposition of individual elements, and the increasing beterogeneity of such individual parts we regard as the logical outcome of the law of evolution.

Thus it is we expect the physiological areas ascertained by Ferrier to exist in the brain of the monkey and other animals to exhibit a structural differentiation characteristic of those parts, and hence to be beloful in the recognition of analogous regions in other coders. If it can be established that areas, whose functional endowments are familiar to us, present uniformly specialised mustomical features, we may reasonably conclude that other structurally differentiated areas, whose functions are unknown to us at governt, have each and all of them hirerse endowments. An attempt to delineste the lumologous areas. of the cortex in different orders of mamualia by simple impection would (on a priori grounds) only lead to failure; indeed, covers have already teen frequently committed with respect thereto; the method of physiological experimentation can alone lead to conclusive results. But, meanwhile, we should not neglect the important consideration of making ourselves acquainted with the intimate structure of the cortex, which also has its own special significance, and which would frequently enable us to avoid the error of drawing our analogies from a more superficial resemblance of the convolutionary surface.

The gray matter enveloping the exterior of the corebral hemispheres, the cortex cerebri, merits our most careful study, as being presentently the site of those deranged functions and pathological processes which express themselves in mental disease. Whatever the limits our definitions compel in to impose upon the sphere of consciousness, all are agreed that here, in the wondrous web of serve cell and nerve three, take piace those activities which underlie the conscious states we denominate mind. It becomes therefore, an essential part of the training of the student of Mental Disease to render himself practically acquainted with the structure and functions of the cerebral cortex—the "tissue of mind." This gray envelops which receives the terminal extensions of the ingoing channels of communication with the curvide world, on the one hand, and forms, on

the other hand, the arigin for the outgoing currents of the same, plays a supreme rife in the nervous blesarchy, and to it all other centres of grey matter are subordinate. In the human brain, the corten is continuous all over the hesstapheres, dipping into the various select between its convolutions, and terminating at the median constricting ring through which the brain-stem of the peduncles and the great commissional tract of the corpus callesom pass.

The distribution of the surface into intricate convolutionary folds, such as occur in man, is at the outset somewhat perplexing to the student. For better is it in his case to study the brain of some of the lower animals, which present a smooth non-convoluted surface, and gradually extens his enquiries to the convoluted brain of higher animals, and, lastly, of man. Beginning thus with the simpler forms of life, he is better able to appreciate in the wonderful architecture of even these simple brains the profound intricacy of the nervous centres of man; he meets with fewer obstacles at the outset to discourage his attempts, and he lays the fundation for a comparative knowledge of the brain, which will be of inestimable value to him in his subsequent studies.

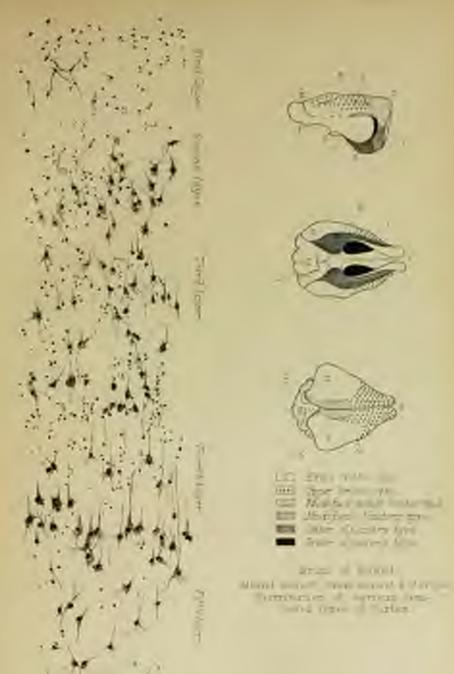
We shall adopt this plan in the following study of the cortex cerebri, and commencing with the brain of a small Rodent, which is a smooth-brained animal, take the Rat as our illustration.

Histological Elements.—In the first place, what are the cionentary constituents of the cortex. This is a necessary question to dispose of, are we pass to their local distribution, regional preponderance of certain elements to the exclusion of others, and their relationships to underlying tracts of medalls. The elementary constituents of the cortex are

- (a) Nerve tells.
- (5) Medullated and non-medullated nerre fibres.
- (e) Connective meshwork of "neurogia cell and fibre."
- (d) Blood-vanishir ropply.
- (e) Lymphatic supply.

(a) Nerve Cells.

Minute Structure.—The nerve cell, in contradictination to the zerve neit, or neuron, in an irregular mass of protoplasm, in a large proportion of instances approaching a more or less spheroidal contour, but frequently elongated, fluiform, translate or multipolae. Its contour is dependent upon the size and number of its branches, and thus a bipolar cell will assume a spindle form, whilst a multipolar cell will partake of an amorboid contour. Whatever the form of cell, however, certain constant characteristics are deplayed in all slike in common with the cells of all animal times. The nerve cell incursially



the second second second second



contains a nucleus—morally of large proportionate size compared with the cell itself, and of a structure exemitally differing from the cell protoplasm surrounding it. Apart from morphological differences a chemical distinction exists tetwict nucleus and the cell body, which is of critical importance in the physiological phases through which the cell passes, and to which, later on, we shall refer. The nerve cell has no definite wall or membrane, such as we find in the vegetable cell, although in pathological states such formed material is often to be recognised; on the other hand, the nucleus is passessed of a distinct membrane which sharply demarcates it from the surrounding cell protoplasm, and which, in certain cells, may assume a considerable density. Usually placed centrally within the cell, the nucleus may, in certain morbid conditions, he transferred to the side or he dislocated to the spical pole of the cell, as is so often seen in the pyramidal cells of the cortex.

The Cytoplasm.—The protoplasmic contents of the cell apart from the nucleus is spoken of as the cytoplasm; whilst that of the nucleus is known as the karyoplasm. The cytoplasm is by no means clear, being sense and structureless, as direct observation of the fresh unstained cell would lead us to infer; but is, like the corresponding karyoplasm, of highly complex structure. A very delicate fibrillar structure percades the whole cell, becoming continuous with close set parallel three, which pass into the several processes given off from the cell hody, and to which they give a fixely stricted appearance. As these fine stric pass into the cytoplasm from the cell processes they diverge and form, according to ment authorities, a sort of reticulum, or delicate meshwork or sponge (spengasphasm) which supports peculiar granules or red-like bodies known as the chroscophil granules of Nisal.

The achromatic fibrillar structure or cytoreticalum has been recognized by Benda, Dogiel, Niesl, and others, in nerve cells, and has been identified by them with the flur mass of Fleming. Although the achromatic fibrils are traced into all the processes of the cell, the granules of Niesl (or "chromatophilic" unlettance) do not enter the axen, as was shown by Benda in 1886, whilst they extend fevely into the large dendrons. The "chromophilic" masses of Niesl, usually red-like, lettrahedral, polyhedral or granular in aspect, may be disposed concentrically around the nucleus, to parallel to the cell contour: whilst, converging towards the dendrons, they comes through the latter in parallel streaks. They show a very strong affaity for certain dyes, supecially the colour derivatives of disphenylamine—such as methylene blue and thionin, and so also for talmidin blue. With the former of these stains, as by Nisala method, the granule masses are deeply coloured, as are also the nucleoit, whilst the nucleus remains

unaffected. Nint has classified all nerve cells according to whether the granule masses are arranged:-

- (1) In a peticulated pattern in mechanic (Archyochronic):
- (2) In chargated spindles, streaks or leasts (Stychockrosse);
- (3) Or without any apparent order or groupings (Grynchusman).

These granules are regarded as incruating the sytureticalists, filling up more or less its meshwork. When they are approximated by the diminution or skrinking of the cell they show deeper staining, and the cell is regarded as in a restling stage (pyknomosphic); when more widely diffused and the cell increased in nor, it is regarded as evidence of functional activity (apyknomorphic). Since the term "resting," however, has long been applied to the stage preceding mitosis, it should be discarded here; as also should the term "chromophilic" as applied to the granules of Nied, since it is likely to be confounded with the chromatin number of the nucleus, with which it must not be identified.

Lugaro * regards Nissi's granules as identical with Fleming's "interfiler" mass, and, so far as cell function is concerned, as having a passive role.

The filar atructure is supported by the more fluid, transparent ground-substance or hyaloplasm. Reasoning from analogy we should presume that this reticulated structure is itself composed as in other animal cells, of extremely minute granules—the no-called "microsomes"; and that they are probably directly continuous with the similar structures in the nucleus. If this he so, the nucleus evidently does not lie free within the cell.

The cytoplasm of nerve cells is very frequently the site of pagment granules, which, in the pyramidal cells, in physiological states invariably assume a position at the base of the cell; but in pathological states may be very widely diffused throughout the cytoplasm.

Granular proteid matter is also found here in disease, as well as fatty granules—products of cell metabolism. These, together with various, form the principal lifeless structures in the cytoplasm.

The nerve cell is, according to Lenhousek, not an exception to other times cells as regards another all-important constituent of the cytoplasm: this is the so-called "centrosome"—a single or double granule exceedingly minute, scarcely larger than a microsome, deeply stained by certain reagents, and distinguished by its forming the centre of a peculiar area of the cytoreticulum called the "attraction-sphere." Usually in close contiguity to the nucleus, it forms the starting-point

^{*} Riccita di Parliei, nere, z. Mest., Sel. 1., Jan., 1886.

^{+ &}quot;Safe Molifonian delle Cellale persone nei diversi Stati fazettomak."
Le Sperimentaly, vol. alix., Aug., 1995.

for all those mysterious changes which result in division of the cell and reproduction.

Ayers has identified the centrosome in the nerve cell of the electric labe of the Torpede, and has noted the frequent presence of two, or even three, suclei. He also clearly traces the division of such nerve cells in the Torpedo brain—although the usual teaching has been that after the third month of fetal life the neuroblasts no longer increase in number but in size only (Hie), and that the appearance of axons and dendrops is final for all further cell division.*

Nucleus. - An before stated, the sucleus is a constant feature of all nerve cells; usually spherical or oval in contour, sheep edged from its possession of a limiting membrane, it contains within it a groundsubstance or kneyolymph pervaded by an extremely free thread-like retirnium - the linin reticulum, with minute granules along its course, and continuous with the nucleus membrane and the cytoreticulum of the sell. But, beyond this, a much courser structure readily stained by certain dyes, and which varies much both in amount and in appear. ance at different periods of the cell life, is a still more prominent feature. This latter material may form an irregular meshwork or accumulate in large granule masses, and is peculiarly characterised by staining of an intense depth with basic aniline dyes. From the latter feature it is called "Chromatin," and must be carefully distinguished from the "chromophilic" granules of the cytoplasm. Within the nucleus is mustly found a spherical body stained deeply by plasma dyes, and, so, reacting like the cytoplasm: this is the so-called " pracleolau."

Dendrites and Thorns.—The dendrites of the cortical nerve cells are baset in most cases, if not in all, by definite there-like projections, each tipped with a minute bulb, which, together with the stalk, is stained deep black by the silver-chrome and mercury methods of Golgi and Cox. They resemble the gland-bearing hairs of the vegetable bingdom rather than true spines, thoras (ipines), and commence where the first branchings of the main dendron occur. They give the dendrites a rough, hispid appearance, which at once severe to distinguish the pretoplasmic processes from the smooth centessed saon, the latter being always devoid of such projections. These thoras or generales, as they have also been termed, vary considerably in length at different sites along the dendrite—Hill states from 1 s to 5 or 10 s; the "longest being found in the granules of the olfactory bulb." i

The function assigned to these thorns has been that of affording multiple points of contact for the nerve fibril, maked axons, and terminal artorisations, which pass athwatt the dendrites. On the

^{*}Morphol, Labor, Univ. Missouri, Columbia, March, 1884, r. Nose on Thoma, * Boses, vol. xx., p. 135.

other hand, the theory held by Hull is expressed by him in these words:—"The thorn is really the cell end of an unstainable nerve filament surresunded by a film of staining cell plasm." If this position be confirmed, the whole doctrine of conduction of nervous currents by contact falls to the ground and the continuity doctrine of Gerlach would, with certain modifications, he re-established.

Chemical Constitution,-The linin network of the nucleus and the extereticulum are identical in constitution, and, as Wilson indicates, this identity is well established by the fact that the spindles of the mitatic figure in certain rare cases may arise solthin the nucleus, as where we have an intra-nuclear controcomo. This arkeperatic network has, of course, a chemical constitution entirely differing from the chromatic network or chromatin masses, as indicated by staining reactions. The minute granules along this network stain readily with acid aniline dyes, such as acid factain, costs, rubin, and Congo red; granules so resetting are termed Oxychromatin granules. On the other hand, the granules and masses of chromatin are termed Basichromatin since they stain vigorously with basic suffice dres-via, methyl green, saffranin, Bismarck brown. The Basichromatin or Chromatin of biologists is now almost definitely ascertaized to be identical with the Nucleins (Mescler) complex organic compounds of nucleic acid and albumen, in which the proportion of analoic acid may vary very greatly.

It has been ascertained by direct experiment that mixtures of uncloic seid and alternen when treated by mothyl green and seld factorin take up a green, bluish violet, or red coloration according to the amount of Nucleic seld persent—the basis dye always predominating with the larger amount of nucleic seld (Malford). The deeper staining of the basishromatin, therefore, indicates the presence of larger proportions of nucleic seld; and this seems to be indicated in certain pathological states of the cell nucleus as in hydrophobia, also in certain physiological phases of the cell life—as in the case with the chromosomes just prior to and during mitosis, and again with the nucleus of the spermaterson, which, judging from the intensity of the reaction, must be nearly pure nucleic acid.

Sucleic acid is remarkable for the large amount of phosphorus combined with it—pure nucleic acid having over 8 per cent, of phosphorus and no sulphur; whilst the nucleius found in cell nuclei vary to their amount of phosphorus from 3-2 to 9-6 per cent. In fact, we have to the percentage of phosphorus the means for estimating the purity of nucleic acid in basichmentin. The chromatin network embraces also many granules identical with the exychromatin granules of the networking network; and, since every phase of coloration

^{*&}quot; The Chemic Silver Method," Brain, 1895; also for oir, vol., xx.

from basic to acid reaction occurs in these granules when treated with differential dyes, it is believed that the chromatin is directly convertible into oxychromotin by the loss of its greater proportion of phosphorus—in other words, a lower member of the nuclein series results (Wilson).⁸ All late researches seem to point to the fact that in the growth of the chromatin masses, and in the loss of their stating capacity for basic dyes, we have evidence of the taking up of albuminous material and the giving up of phosphorus, and that this occurs during periods of great constructive activity of the cytoplasm i whilst, with the diminution in size of the chromosomes and their more interacataining, such synthetic metabolism is at its lowest chb.

It is of great interest to note that the nucleins which play so important a part in the economy of the nerve cell (as well, indeed) as in all cells of both vegetable and animal tissues) have as their decomposition products the highly nitrogenised compounds called the xanthin bodies—viz, aslenin, guarin, xanthin, and hypoxanthin, and which, as disestrated by the following table, are the direct precuraces of serie acid which probably represents the total result of nuclein decomposition:—

Physiological and Pathological.- As jot, we are far from being able to give a decisive opinion upon the physiological algoridcance of the systemiculum and the chromatophil granules of Nissl. Authorities are much at variance on this point, and the results of experimental research are frequently of a conflicting nature. It may not be premature, however, to give here the more important and sceningly conclusive results obtained. In the first place, the granules of Nissl, or so-called "Tigroids," may be regarded as representing Pleming's inter-filar mass; the unstained, achromatic substance corresponding to his filar mass. In the next place, these granules form no part of the conducting mechanism of the neuron—they play a more passive rife. Whether they be nutritive unterial, as Luraro suggests, or whether (as we opine) they in some manner intensify the pervans discharge along the conducting strainly, they take no direct part in the conveyance of the nerve angular, which almost certainly is the attribute of the achromatic or filst network (cyteronicalum). Although, as it were superadded to the true unatomical conducting mechanism of the source, they by no means act like the lifeless holies which are so often found in the cell protoplasts generally; on the contrary, they are peculiarly sensitive in their reaction to various

^{* &}quot; The Call on Development and Inheritance," Columbia Univ. Birl, Series, iv.

agencies, although Lugaro would maintain that they bear a direct relationship to she size of the cell rather than that they vary with its functional conditions. A great mass of evidence is, however, new forthcoming to show that these granules, both during cortain physiological phases of cell life and as the result of experimental irritation, transmation, or pathological change, undergo very notable and extensive alteration.

Chromatolysis.—The most familiar change observed consists in a peculiar diffusion of the chromophil granules, which instead of lying closely around the neighbourhood of the nucleus as in pyknomerphic cells, are scattered peripherally, the granules being more widely severed, whilst the nucleus is often displaced towards the periphery of the cell. Occasionally, a clear zone surrounds the nucleus still central in position; or, again, the granules may be generally diffused and broken down into a fine pulversient condition, giving the cytoplasm a punctuated aspect. In other instances the granules may not be so much altered in form as displaced outwards, and surrounding an unstained vitreous, homogeneous looking substance.* Chromatolysis may be a purely functional change—the granules may again resums their former size, position, and staining reaction; in the other hand, it may be the precursor of complete loss of normal structure and break down of the neuron.

Fatigue,-Attempts have been made by electrical excitation of the nervous system of the frog, the dog, and est (Hodges) to sacertain the effect of fatigue thus induced on the cells of the spinal ganglia; and Pich has examined the nerve cells after execution of a criminal by electricity, in which 1740 volts had been passed, and in which be found notable vacuolation of nerve cells. In a second case, however, as well as in animals killed by the electric current, he quite failed to find similar changes. All such attempts are too course to teach us anything with regard to normal physiological processes; and the appearances resulting can only be classed with pathological results, such as would easte where shemical, thermal, or mechanical irritants were employed. Normal fatigue has been, however, studied in the ganglia and brain of the honey bee, the sparrow, and pigeon (Hodger). In such phases the nucleus lost its network or reticulated uspect, decreased in size, and became cremated in contour. The sytoplasm urually shrinks considerably, does not stain so readily, and losss its affinity for acygen I scentionally vacuolation occurred. The normal condition was only very along restored after prolonged rest, five bours' stimulation requiring twenty-four bours' repose for complete repair. Gustav Mann describes the same results, affirms that there is

^{*} Dr. Adolf Meyer has described several types of chromatelysis occurring in degenerative discusse of the overce. American Joseph of January, vol. in., No. 2.

a diffusion of chromatin within the nucleus, and that cell, nucleus, and nucleofi all alike increase in size in states of activity of the neuron. The chromophil granules in the sytoplasm show slight increase during functional activity, and dimension in amount and diffusion only with extreme fatigue (Lugaro).

Lesion.—If by section, ligature, compression, chemical or thermal irritation the axes be destroyed, beyond the changes which are wellknown to result in the peripheral segment and muscle to which it is supplied, we find the motor cells subject to a chromatelysis, such as has been already described—vin, primary increased size of cell, scattering and diminution of chromophilic granules from the centre outwards, wandering of the nucleus to the periphery without any change in its integrity, and, eventually, a lessening of the size of the cell. Such changes have been established by the observations of Nissi, Marinesco, Lugaro, and v. Gehuchten within 40 hours after lesion; and repair does not set in for two or three weeks, nor is the normal re-established for about three months.

In such cases no change occurs in the cytoreticulum; the achromatic constituent remains intact, whilst the complete repair undergone proves that no genuine dependentics has taken piece, but that the process is one of simple deranged function. A much more rapid chromatolysis, followed by destruction of the cell, however, occurs, in the case of the spinal gaugiton cells, in section of the peripheral nerves (Marisesce); a fact explained by their severance from all trophic influence.

Configuration.—Recent research into the general morphology and intimate histological attracture of the nerve cell has so far enlarged the boundaries of our knowledge, that it becomes essential to start with a definite terminology which includes no ambiguous terms for the complicated apparatus presented as the modern conception of a nerve cell.

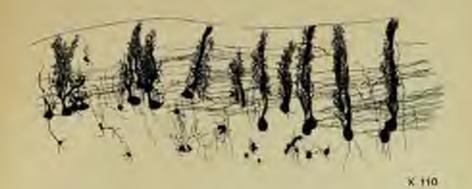
The body of the ceil, including all its contents, we shall denominate the cell or neurocyte; the peotoplasmic body of the cell, in contradictinction to the nucleus, may be termed the neuroscene or cytoplasm. If the cell is provided with protoplasmic processes, we speak of the main trunk as the dendron, and the finer arborisations, as the dendrites. If one of these occupy a polar position whilst the others arise from the base or sides, as in the pyramidal cells of the certex, we should designate the former as apical or primary dendrons, and the others as lateral, basal, or secondary dendrons. The dendren, be it remembered, is not an essential part of the cell, since many serve cells have no dendron. The axis-cylinder may be much mere conveniently termed the axon, which may be naked (non-medullated) or medullated, and such branches as arise along its course, as collaterals. The distal termination of an axon or

its collaterals in a plexus, we speak of as a terminal arborisation; and for the whole system thus embraced, i.e., the neurocyte with its axon, collaterals, terminal arborisations, and, if present, the dendritic expansions, we use prefembly the term neuron to the original sense adopted by Walderer.*

The Neuron,-The zerve cell or neurocyte may vary much in contour; it may be pyramidal, small or large in size, giving origin to apical or primary dendron, whilst from its sides and base emerge secondary dendrons as well as the axon; it may assume a swellen, inflated, or flask-like configuration; or may be elongated in a long spindle-like element, either pole being the origin of extended processes, as even in the lowermost layer of the cerebral cortex and the claustral formation. It may assume an irregular, angular, polyhedral form; ec. again, may resemble a large granule, in which the nucleus is of large proportionate size, and the cell protoplasm greatly limited in amount, us is the case with the granule cells of the cortex recebri, the cerebellum, and other regions of the nervous centres. It must be understood that our description of the contour of the neurocrte and the size of its individual parts, refers entirely to fresh frozen sections—the deforming influence of chrome reasonts, and of the silver and mercurial reagents of Golgi and Cajal being so great us to require checking by examination of fresh specimens. It is not, however, upon these diversities in contour that we can lay such emphasis as was formerly done-but the whole neuron-cell, axon, and dendron (where present) must be considered in all its diversities of form before we can relegate the unit to its proper place in a rational classification. We shall, therefore, consider shortly the more important forms of neuron presented to us in the cortex cerebri, cerebellum, and their dependencies. The elements thus to be discussed are as follows :-

- (1) Augular and sensory rolls of Gelgi.
- (2) Granale rells (reretrum, combellium, comm, olfartory lobe, retina).
- (3) Pyromidal rells of cortex and its varieties-
 - (a) Meter rell.
 - (d) Pyramids of come.
 - (5) Celli of Perkings.
- (4) Cidls with according exem-
- (5) Cells of peripheral man,
- [6] Mittal cells of olfactory balls.
- (7) Inflated and irregularly globour cell.
- [8] Spindle eeffa.
- (1) The angular cell is of very irregular contour, occasionally approaching an oval, a pyriferm, or even a fusiform outline. It quite as frequently assumes more of a pyramidal, and still more frequently an inverted pyramidal contour, due to a bicorned formation of its

^{*} Describe med, Worksander, 1869.



Voz. s.



Fig. 2

CEREBELLAR CORTEX: CELLS OF PURKINJE (HUMAN).



apperment pole; in fact, its distinguishing feature is this great irregularity in form. These cells poculiarly characterise the second layer of the cortex, and may be well seen in the great limble lobe of the Pig or of the Sheep. To see its more notable development, we must turn to the lower are of the limbic lobe in the Rat or Rabbit, or what corresponds to the gyrus hippocampi. Here, within the area limited by the limbic sulcus (Plate i., a.v.c.), are seen dense clumps of these irregularly-shaped nerve cells closely appressed, netally measuring 18 s = 10 s in size, with a nucleus of 9 a in diameter. An important character borne by these irregular elements is the relatively large size of the nucleus, as compared with the pertoplasm of the cell; this feature, seen in these elements in the rodent, in the sheep, the pig, and other mammala, is also seen in the cortex of man." In osmatic mammals, it forms, as we shall see, a special cortical type, and we are struck further by the dones meshwork of ramifications which arise from its outermost branches. The angular cell may be recognised at other levels, but it is here (gyrus hippocampi) that its richest development occurs;

Amongst these angular cells are scattered globose or shot-like cells—the "Cellule polygonale" of Cajal, which, as seen by the silver-chromate method, and especially by the modified Cox's process, are apparently identical with the scannry cells of Golgi. These cells throw off numerous protoplasmic processes, which are rough and thorny, like the dendrous of the pyramidal cells, and which divide and subdivide as they spread outwards from the cell. Moreover, from each cell arises an extremely delicate naked axis cylinder or neuron, which throws off along a complicated course numerous offshoots or delicate collaterals, which conjointly form a complex system of curves around the cell or stretch into distant parts of the certex, either upwards, downwards, or horizontally in its peripheral zone (fig. 9).

(2) The granule cell is a small element, averaging 10 a v 8 a in size, and many not larger than 9 a, and with a nucleus of 4 a to 5 a in diameter. Slightly conical in form, with relatively large nucleus, the delicate protoplasm extends into several extremely fine processes: an apical process being also often present. This element forms an important constituent of sensory realism of the brain, and may be seen as a densely grouped formation in what we have elsewhere described as the modified upper limbic type in the rodent? (Plate vi.). In the histological study of the cortex, these two varieties of cell—the angular and the granule—are so diverse in forms, and their regional.

^{*} The Cortical Lamination of the Motor Area of the Brain," Proc. Ecycl Soc., No. 185.

^{7 &}quot;The Companion Structure of the Brain in Rodents," Philosoph, Terror, part 6., 1882, p. 599.

distribution is so distinct, that it would be inexcusable to confuse the two formations as of identical constituents.

Several varieties of granule cells exist which, by the older methods of research, were not differentiated, but can now be readily distinguished. The more important are the granule cells of

(i) Cerebran; (f) Cerebellam; (5) Corns Ammonta; (4) Offsettry both; (5) Setins.

By some authors it is dealered if either of the last two is correctly to be claimed as a true nervous element; both are supposed to be devoid of that all-essential feature of the neuron—vin, as nxon. Proteplasmic processes certainly do exist, branching similarly to those of other nervous elements; but, in the absence of the axon, the granule elements of the offactory bulb and the spongioblasm of the retina might, by some, be justifiably claused as connective structures.* Those of the cerebral cortex average 10 a by 8 a in sice, many not larger than 2 a, with a nucleus of 4 a to 5 a in diameter. Slightly conical in form, with relatively large nucleus, the delirate protoplasm extends into several extremely fine processes; an apical process being also often present. This element forms an important constituent of sensory realms of the brain, and may be soon as a densely grouped formation in what we have elsewhere t described as the medified upper limbs type in the rodent (Plate iv., fig. 1).

The small granules of the cerebellum on the other hand, forming the densely packed inner certical layer, give origin to three or four small stanted protoplasmic processes, rapidly ending by subdivision amongst the neighbouring granules. The axon arising from one of these same processes passes straight up into the pure grey layer, and, bifurcating at right angles, each division courses in contrary directions parallel to the certical surface. Their intimate relationships we shall refer to later on (Plate viii., fig. 1).

In the fascia dentata of the corm Ammonia the granule element is peculiar; its protoplasmic processes arise wholly from the outer pole of the cell to spread widely in a rich plume into the peripheral zane. Its axon passes through the granule layer, and, after giving off numerous collaterals, becauses continuous with the so-called "Mousfibres" of this region, which ramify across the dendrous of the large pyramidal cells (Plate vii., Eg. 2)

(3) The Pyramidal Cell.—From its uniform contour, large size, very general distribution (regional), and depth of formation, this cell has come to be regarded by many as pre-emineatly the nerve element of the certex.

^{*}See " Notes on Granden," by Alex Hill, M.D., Seein, tol. Co., p. 125.

[#] The Comparative Structure of the Brain in Rodents," Philosoph. Trans., part its 1882.

Pyramidal is a name appropriate only to those cells which have undergone the corrugating effects of chrome, other hardening reagents, or desicestion. In the fresh state they are wholly different in configuration from those seen in hardened specimens. On the other hand, Meynert is far too exclusive in stating that their true form is that of a spindle; in fact, they are very variable in form, often plump and rounded off at their base, lengthened out and attenuated at their agex. The pyrifters contour is very general -mante angular projections of proteplasm on all sides mapping out the origin of delimite processes. Occasionally they are elongated and truly finiform, especially in certain definite regions of the cortex; and yet others occur where the body of the cell in larger above than below, its lower end being in fact. attempated, so that the cell has the contour of an inverted avoid. Where they approach the pyramidal form it is usually one of a very irregular triangle, with sides irregularly broken by numerous deathtions caused by the processes distributed therefrom. From the summit of the cell arises the agex process, or primary dendron, directed radially to the surface of the cortex, whilst on either side from the haud aspect—the secondary—fairly stout beanches diverge—not at right angles, but forming an obtuse angle (of about 120" very uniformly). with the long axis of the cell. It appears to us that these stoot lateral branches (which, with the spical, form by far the most prominent extensions of the cell) explain its triangular or pyramidal form upon shrinking in chrome fluids. The agex process, or main dendron, passes apwards towards the outermost layer of the cortex, to which it usually, but not invariably, extends ; small branches arise from thickened axils along its course, and, eventually, the main branch divides and subdivides into a large number of branches forming a rich plume within the tirst cortical layer. These desdrites appear to terminate immediately beneath the pie, or aweep horizontally beneath the latter for varying distances. The most important feature revealed by the silverchrome method as regards this apex process and its deadritic plumule, is the fact that the branches are opporently terminal, and are clothed throughout their course by minute thorn-like appendages, each sursecunted by a minute bulb or bend-like head, in the intervals between which he the axons or axis-relinder processes and the terminal arbor-Stations formed by the latter (Plate xill, fig. 2). Cajal * terms the primary dendron the trunk (tipe) as being the earliest evolved of the protoplasmic processes. These bodies, therefore, throw of three asts of protoplasmic fibres;-

(a) The apical dendrons, which are by far the most conspicuous, and always radiate to the surface of the cortex;

^{*}See on this point—Cajal. "Sur la Structure de l'Ecorce Cérébrale," La Chi'ele, 180), tome val., p. Elik. Also the author on "The Structure of the First Layer of the Course," Erica. Med. Journ., Jene., 1807.

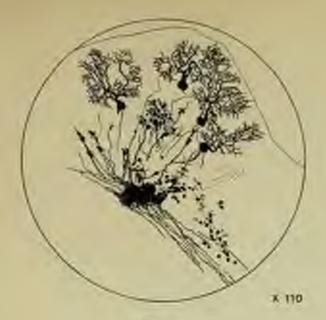


Fig. 1.



Freiz.



- (b) The large basal dendrons, running obliquely outwards and downwards on both sides; and
- (c) Numerous very delicate lateral dendrons radiating from all intervening districts of the surface into the nervous meshwork around.

These lateral protoplasmic processes give origin to numerous branches which ratnify extensively in the neighbourhood around the cell, and, like those of the apical plumnies, are also invested by themy appendages (épiser).

The axon passes downwards from the lower pole of the cell, or from a hazal dendron here, to enter the white medulla of the cerona radiata: its constitution and relationships can be better relegated to our description of the first variety of the pyranicial cell, viz.—the Motor.

Each cell contains an oval nucleus, with well-defined nucleolus, $7 \times 5 \times 6$ in size. The dimensions of the cell wavy from $12 \times 8 \times 8 \times 10^{-3}$, in the more superficial to $41 \times 23 \times 10^{-3}$ in the deeper layers.

(a) The Motor Cell, -We are alive to the exception which may be taken to any such implication as the above designation conveys; yet, as it appears to as that the argument in favour of their motor endowments has been materially strengthened by further examination of the question, we prefer this designation to that of giant pyramids, which was proposed by Betz, more especially since these elements may he recognised by certain features in certain regions, where they by no mesns deserve the ephilhet "gund coll," being even smaller than the lower cells of the third layer above them. The motor cell, taking into consideration the more characteristic elements, are the largest cells found in the cerebral cortex. Some of the largest of those measure 126 a in length by 55 a in the shorter diameter; the average dimensions of a very large number in the ascending frontal convolution being 60 a x 25 st. The extremes are 30 a and 96 a fee length, 12 a and 45 st. for breadth. They contain an oval nuclem, 13-20 s in greater by 9-12 s. in lesser diameter. In form these cells are very variable, usually, much awailen, plump looking bodies; they are elongated and attenuated towards their spex process, throwing off the greater number of protoplasmic processes from near the apposite pole. The contain of these nerve cells appears related to the number and size of their branchesin, the greater the number of such processes, the more byegular the contour: whilst the spical and basal processes being usually the larger, the cells tend to lengthen out in their direction and savame a more or less fasiform outline. Large processes, however, given out from various other points of the cell, greatly modify this spindle form, as that extreme variations in configuration occus. We shall see that we have reasons for believing that the primitive form of all these nerve cells to globour or slightly pyriform; that the fusiform outline is the next stage of their development; and that further modifications occur

as other processes beyond the spical and basal extend laterally. So likewise we shall see the rurerse change undergone by the cell in the dissolutions of disease.

The cell and, in the normal state, no cell-wall; but the appearance of such in readily induced by respents and disease. In freak specimens obtained from freeze brain, the cell is seen to consist of a delicate protoplasm, which appears to be directly continuous with its various processes; nor can any trace of the fibrillated structure of the cell-contents described by Max Schultze be detected unless, indeed, respents be employed. Then we obtain, as by Nimi's method of attaining, evidence of a complicated structure, to which we have previously referred (see p. 57).

The lower pole of the cell is usually pigmented as a normal condition, just as is the case with the multipolar cells of the spinal cord. A large round or aval nucleus enclosing a nucleolus is always present in these cells. Each cell throws of what may be termed primary and secondary protoplasmic branches—the former the spical extension; the latter including all other processes except the axon, whether coarse or delicate filess. The division usually adopted by Continental writers is into contributal (apical and lateral accordary processes) and centrifugal (axis-cylinder or axon).

The apex process or primary dendron, formed by the gradual attenuation of the cell, passes straight up through the experiacent layer of cells, throwing off in its course several collateral protoplasmic processes, which usually run obliquely upwards and outwards from the trunk and lose themselves in the neighbourhood around; whilst, as in the pyramidal cell above described, the main trusk, on entering the peripheral zone, furnishes a rich dendritie plume to that layer, the Ebres of which similarly present a fine hispid appearance from minute projecting spines. Since in the motor cortex these nerve elements are aggregated into groups or clusters (Plate v.), these apical procosses, closely approximated, often run in sheaves through the more superficial layers. A basel protoplasmic process often arises in like manner from a gradual attenuation of the opposite pole, as in fusiform cells, and large lateral branches may strike out from this extended pole. The band process usually, however, continues downwards for some distance, when it gains a thin investing sheath of medulla, which gradually thickens upon it, converting it into a true meduliated nerve fibre. Hence this process is termed the axon or axis-evlinder process. Upon this Meynert remarks-" It is the more rarely seen because, being the process which enters the medalla, Its direction is dependent upon the angles formed by the funciculi of the latter, which by no means form a straight line with the apical

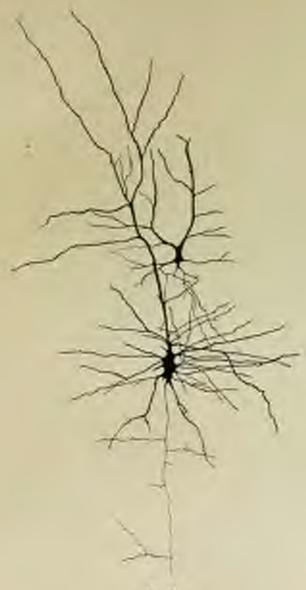


Fig. 10.

processes of the pyramid."* This obliquity of position, therefore, necessitates its being cut off in sections on a plane with the radiating apical processes. This statement, havever, no longer remains true for the same methods of preparation, since the wealth of structure and comparative thickness of sections commined in silver-shrome preparations admit of the axon being readily seen in most cells (fig. 10).

The secondary or lateral processes which radiate from the cell an all sides, unlike the primary, divide and subdivide almost immediately after their origin, and interface in the intricate webwork of nerve and connective fibre around the cell. Schaffer has recently, indicated that these accordary processes are readily distinguished from the axons by Nisal's method of staining; spindle-shaped chromoshil bodies stained by methylene blue are grouped around these secondary processes, but the axon is devoid of such hodies. * We are apt to overlook the extreme complexity of structure in vertical sections of the cortex, and should compare with such sections others carried never the long axis of the cell (obtained by placing the cortex surface downwards on the freezing microtome, and cutting down to the level of these cell groups). Such sections show us one or two cells as the centre of an area to which their branches are distributed; their finest runifications crossing and recrossing, but not inocculating, with those from adjacent cell territories. The termination of such branches is regarded as absolutely feee-i.e., no true meshwork by remains of the branches of one cell with the other is supposed to occur; at least, such is the appearance presented by sections prepared by the Golgi and Cosmethods of examination.

We have observed as many as eighteen main processes diverge from a single cell in such sections; in vertical sections the average number seen is about seven, but as many as fifteen have been observed. When it is remembered that so single section can show (as the tearing methods, however, do) the actual number of branches in any single cell, the above statements will indicate the wealth of communicating branches which these "motor units" possess.

The axon, no before stated, arises directly from the gradual attenuation of the lower pole, or it may arise indirectly from a band dendron. It passes downwards towards the medulla, throwing off at right angles along this course some six to ten extremely fine collateral branches (Cojal), which end in delicate terminal ramifications around. The axon still maintains the same uniform directations, and, entering the medulla, it either bends at right angles to continue its further course or bifurcates into two divisions running in opposite directions.

When we come to examine what appear to be the corresponding

⁺ The Brain of Meanurals, Stricker's Hamiltonic, p. 187,

⁺ Neurologie by Chates Stay, Doc. 15, 1993.

cells in the cortex cerebri of some of the lower mammals, we find certain strong points of resemblance, together with certain distinctive features by which we may very readily recognize them as not human. Thus in the pig, in lieu of the great irregularity in marginal contour sees in man, we observe, on the contrary, a notable uniformity of contour, the ulungate pyramid being the almost universal form. "They reaembie closely, both in size and form, the large pyramidal cells at the depost portion of the third layer in bimana, quadrumana, and the large carnivors, as also the gasplicade cells in the parietal and temporosphenoidal lobes of man. Nowhere do we find the irregular, assolien,



Fig. 11. - Combral cortex - nerve cell from desper 20040 of cortex (human).

and at times almost globace cells so frequent in the motor area of the human brain." Again, in the sheep, we full to find the plump rounded cells of man and the higher mammals; but the cell is more sariable in form than in the pig, the elongated pyramid being interspersed freely with long spindle forms and large numbers of a poculiar "horned" cell, in which the apex process is hifurcate at its origin near the cell. They measure on an average 46 μ × 11 μ . In the cat, however, these elements are plump, oral, and pyriform; average 11 μ = 21 μ in size, with an accanional gigantic cell of 106 μ × 32 μ ;

^{*} H Remarkhen on the Comparative Structure of the Cortex Corolet," Proc. Roy. Soc., part 6, 1880

and are grouped together in well-marked clusters. In the rodent (sat, subbit) the type of cell approaches that found in the sheep and pig.

One may readily perceive the remarkable resemblance between these cells and those of the anterior corns of the cord in shooms hardened preparations, but still closer appear their affinities in structural arrangements when traced-out specimens of brain and cord are compared. The inference that these cells are specialised elements rests on this resemblance, on their exceptionally large size and abrupt commencement, and the peculiar electored groupings assumed in a region which has been shown by Ferrier to possess motor endowments (see p. 121). Meynert, on the other hand, who falls to recognise these larger cells," draws a parallel between the whole of the pyramidal cells of the third layer and the motor cells of the cord. His statement is as follows - If we remember that the anterior roots of the spinal cord, at their origin in the auterior cornus, are connected with elements which, through the elemiceness of their bodies the gradual transition of these bodies into the gratoplasm of the processes, and the greater number and size of the latter, are sharply differentiated from the cells in which the posterior roots originate in the interspinal ganglia, these being tunid and provided with few and attenuated processes, an affinity in point of form is at once seen between the pyramids of the cortex and the former, which is common also to the cells of erigin of all motor cerebral nerves, and permits an analogy to be drawn in regard to the significance of the pyramids of the cortex." !

- (S) Pyramids of Cornu.—The great pyramidal cells of the cornu Amazonia in close approximation to the finiteia are peculiar in several respects. From their superior or apical pole arises a very thick deadron, which almost immediately breaks up into a course deadritic arborisation—stunted, and in nowise recembling the finer deadritic plantales of the pyramids of the cerebral cartex. Again, the collaterals arising from the axons of these cells pursue a notably recovered course, pussing by their cells to ramify eventually over the deadrites of the analler pyramidal cells of the cornu. These smaller pyramids, on the other hand, more closely recomble those of the cortex corebri; they are usually pyriform or spinitle-shaped, or, far less frequently, pyramidal in contour (Plate vii., fig. 2).
- (5) Cells of Purkinje.—The flask-like cells of the cerebellar cortex were never satisfactorily displayed in chrome preparations by the older methods of staining with carmine, homotoxylin, &c., the

^{*}See the diagram of the five-layer type in Meynert's Portfeley, and also in Systechem Secrety's Terms of his monograph, fig. 214.

⁺ Renis of Maximals, p. 387.

profuse branchings into the peripheral layer were well revealed by amiline blue-black (Sensley); but yet their axons were revealed merely by a very short projection from their base, their continuation being lost in the subjacent granule layer. Moreover, the einburnte basketwork fessed around the cell, as well as the plexus of branches from suderlying cells, which apread over their main dendrous, were not discovered until the silver-chrome method of Golgi came to our assistance. By this means the cell appears as a flask-like element throwing apwards one or two main dendrous, which divide and subdivide into a rich dendritic arborisation as far as the pall surface; whilst the axon arising from its base passes through the granule layer and, throwing off several collaterals, is seentually lost in the medullated tract of the lamina. Their relationship to the lasket-work and plexuses around their dendrous will be more fully described in the section on the occasional courses.

(4) Cells with ascending Axons.—Certain cells scattered through the pyramidal and gaugifonic layers of the cerebral cortex have been

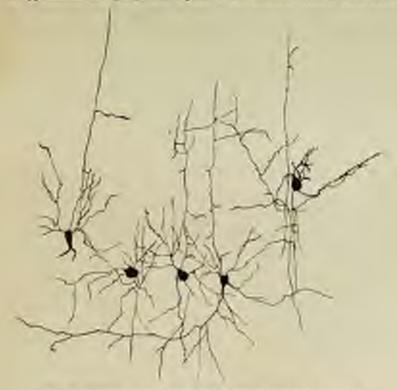


Fig. 12 -- Corobeal cortex: nerve cells of second layer with entenerve remaintaining of accountests.

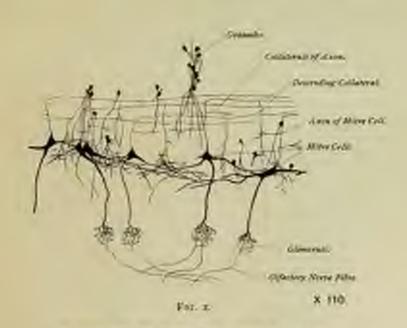
lately shown by Martinutti to have the usual distribution of branches reversed. As frequently spindle-shaped as triangular and throwing off protoplasmic processes both ascending and descending, the axon, on the other hand, arising often from a coarse spinal dendron, occased to the peripheral zone. Here it breaks into two or three branches which take a horizontal course, and subdivide in a very extensive terminal ramification in this the lowermost region of the outer cortical layer. Cajal describes a similar arrangement of certain such ascending axons immediately beausth the second layer (fig. 17).

- (5) Cells of the Peripheral Zone.—These servous elements, to which great importance has lately been assigned by Cajal and others, are either finiform or stellate; the former being hipolar and throwing off from either pole a horizontally disposed protophasesic process which eventually thins off into several genuine axons, disposed parallel to the surface; whilst exceedingly delicate collaterals arise from these to ramify upwards in the peripheral cone. In like manner, the stellate cells are multipolar, yet their branches are disposed along horizontal planes, and throw upwards collaterals in the same manner, all of which have the aspect of delicate axons. Here, then, it will be choosed we have cells provided with no genuine slendritic expansions, the peutoplasmic processes being directly continuous with the axons arising therefrom; moreover, the cells never tresposs beyond the boundary of the certical zone in which they lie.
- (6) Mitral Cells of the Olfactory Bulb, Another very peculiar type of cell is illustrated by the so-called "mitre" cell. This element is triangular, or more swollen or globase in centour, giving origin to lateral ramifying processes, and to a atout dendron, which, arising from its superficial aspect, passes downwards to an olfactory glomernius, and breaks up within it into a rich terminal pictus of branches. An axon also arises from the deoper aspect of the cell to become continuous with an olfactory morve fibre (Plate iv., fig. 2).
- (7) The Inflated or Irregularly Globose Cell.—The nerve cell to which the epithet Inflated has been given has not been, so far as we are aware, described amongst the constituents of the cerebral cortex by any former writers on the subject. We first drew attention to it as a specialised cell, forming a distinct layer of the cortex, in a Memoir on the Comparative Structure of the Brain in Rodents (1882), and subsequent communications faily confirm the description them given. The brain of the mole, rat, or rabbit is expecially subside for demonstrating the presence of this element. The cell which occupies the position of the small "pyramidal" and angular bodies of the second layer is no longer of pyramidal form, but avoilen, inflated, globose, or flack-shaped, and, moreover, of far greater size. The average dimensions attended by it are 37 n = 32 n, with a nucleus of 13 n; some are more.



Pior V

CEREBELLAR CORTEX: STELLATE NERVE-CELL NEAR CELLS OF PUBRINGS (BUMAN).



OLFACTORY BULS OF SAT: SEMI-DIAGRAM.



elongate, measuring 46 μ = 27 μ . Hence, these elements are more than double the size of those usual to this position, and exhibit the apparent anomaly of large cells in the cortex superimposed on a layer of small symmetries. The region in which they are found in really the hindmost extension of the lower limbic lobe (modified lower limbic type) in the todays.

As will be seen later on, the second layer of the cortex in the lower limbic are is characterized by its perality closely apprecial clusters. of small pyramidal or argular elements, with bifurcate spices, which aubdivide into a dense meshwork of fibres | farther back, in the region above indicated, these elements appear transformed into the inflated cell, retaining, however, their bifurcate spices and plexiform branching. The cell throws off numerous line processes on all sides; its protoplasm-exceedingly delicate-shrinks greatly under the influence of alcoholic and other corrugating reagents, and should, therefore, be always examined in the fresh state. When acted upon by chique it loses its characteristic appearance and resembles the vesicular cell, which, in the modulia and spinal cord, is regarded as possessing seastey endowments. Is appears to us that the whole helt of the second layer of the cortex, out of which this specialised cell is developed, may subserve the same purpose that of rensation in its various phases the evidence on this point had better be considered at a later stage of our enquiries,

(8) The Spindle Cell.—This undoubtedly is also a specialised element. The cell is a narrow funiform body, attaining the average dimensions of 25 a x 9 a, the largest being 32 a x 13 a, with an eval or fusiform nucleus 1t a to 13 a in length × 6 a to 9 a in breadth.* Their two principal branches arise from either pole so as to give them in many cases the aspect of bipolar cells; limt, as indicated by Meynert, lateral projections also arise from these bodies. I Frequently this lateral branch becomes large, and the reculting angular projection of the rell-pretoplasm into it gives the cell a triangular or trimdiate form. The cell is regarded as an interculated element of the connecting system of the brain, and direct he christrum is entirely composed of such elements, the term claustral formation has been proposed for it by Maynert. These elements are peculiarly prone to a nuclear proliferation, which occusionally accumulates into little heaps almost concealing these cells from view. In position they underlie the other layers of the cortex throughout its whole extent; whatever be the type of lamination, the lowest stratum will always present us with these apinalle cells of the association system of the brain; this applies equally to the mammalian brain in general.

^{*} Transactions of the Roy. Soc., 1982, part ii., pp. 714 13.

[#] Op. ctl., p. 389.

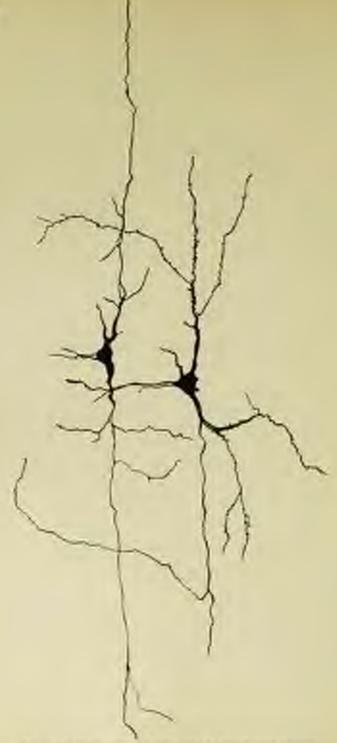


Fig. 13.—Cerebral cortex: spindle cells of deepest layer (human).

We have elsewhere indicated the existence of a perfectly globose cell—with a single delicate apex process, and two or more extremely attenuated processes—without any angular projections from the cell, but a perfectly uniform rounded contour—as existing normally in the second and third layers of the certex of the ape, and as being specially sharecterised by this swellen globuse contour, and great puncity of branches. They are met with in man only in forms of developmental arrest—in idiotey and imbecility; but elements which remind us of these cells, occur in the second layer of the cortex of the pig. These may be early stages in the development of the store advanced forms of cortical cells, and may or may not have affinities to the inflated irregularly globose elements already described in a specialised cortex of the rodent.

The above constitute the various forms of nerve cell which occur in the mammalian cortex, and we must now direct attention to its other histological constituents: these consist of—

- (a) Nerve fibres ;
- (b) Blood-ressels;
- (c) Connective matrix or neuroglia;
- (if) Lymph channels.
- (a) Nerve Fibres,—As is well known, nerve fibres, central and peripheral, present varied forms, corresponding to five stages of dovelopment—from the ultimate fibril up to the enabenthed and medullated fibre of the peripheral nerve trunks. The last, the most perfect and complex form, does not occur in the nerve centres at all. In the cortex, as well as the nervous centres generally, three forms of fibre are uset with—(1) The primitive fibral. (2) Naked, non-medullated or protopherals process. (5) The medullated fibre devoid of a sheath of Schwann.
- (1) The Primitive Fibril.—The representative of the ultimate divisions of the non-meduliated fibre, is an excessively delicate attenuated thread, revealed only by an amplification of 500 diameters; and which, as the result of prot-mortes shange, because headed or shows variousities along its length. They are observed readily from the occurrence of this change by lower powers of the microscope (+350), especially by imbibition of fluid around, which causes them to swell up into large oval variousities. Such delicate headed threads are seen at all depths of the cortex in fresh sections obtained from frozen brain, treated with omnic acid, '25 per cent, and protected by a coverglass; but they are also traceable in sections which have been hardened by chrome, especially in the lowermost layers. They are seen in many cases to arise from the subdivision of larger fibres; they are perfectly handegeneous, betraying no internal structure to the highest powers of the microscope.

(2) The Naked or Non-Medullated Fibres, the protoplasmic processes of Deiters, form an important constituent of the cortex. From what has already been stated respecting the mode of branching of the nerce cells, it will be apparent that the protoplasmic extensions cour in couplicated meshworks throughout the certex. The spical process and lateral extensions pass by subdivision into an intricatemeshwork of fibrils; the haml process becomes invested lower down with a protecting layer of medulla. This is the process to which, properly, should be centricted the term axis-cylinder process; and, for all other extensions of the cell protoplasss, the term nonmedaliated fibre or protoplasmic process should be applied. Since, however, recent research has demonstrated the fundamental distinction betwixt the protoplasmic processes and the axis-cylinder. (the former being invested by spiny projections, and becoming more and more attenuated as they subdivide; the latter invariably emosther, and retaining a uniform dismeter in spite of numerous rellaterals which omerge from it; it would be well to adopt the terms of Dendron and Axon as applicable to these two. Eventually the axon may terminate as a rich arborisation around other cells. Such processes are very variable in size; but, at their origin from the various cells of the cortes, they range between 1 a and 6 a in diagneter: the lateral processes in particular become rapidly attenuated by subdivision, but yet may be occasionally traced over very lengthy tracts; the spex processes, running to the appearant layer of the cortex, may often be traced to their termination here.

These fibres exhibit, under certain conditions of examination, a linear longitudinal marking, which has been described as "fibrillation" by certain authorities (Max Schultze," Landers and Stiefing !): the homogeneous nature of the non-medulated fibre and asserylinder has, on the other hand, been maintained by Kollider,! Weldeger, and others. Since those who support the view of the fibrillation of the axis cylinder regard the fibre as a compound of the ultimate fibrilla already described, separated by a small quantity of interfibrillar substance, and believe them to be continuous through the ganglion cell in what they describe as a well-marked fibrillated constitution of the question of the homogeneity or of the fibrillated constitution of the axis explinder becomes of fundamental importance in neurology. Such fibrils would be regarded as isolated tracts of conduction throughout their length, the nerve fibre itself being a far more complex structure than what it was once regarded as being, and the cell itself would

^{*} Stricker's Houses and Compensation Histology, Syd. Sin., p. 158.

⁺ Text-Book of Human Physiology, vol. ii., p. 768.

² Gorolefeller, 3th Aufl., 1867, p. 244.

[&]amp; Zestudroft für Entereste Medicin, Bittel kw., 1963.

Inre a far different significance. Nor, according to some, need this risible continuity of the fibrills be demanded to establish the case—more or less fusion may occur throughout the length of the fibre; and the splitting up into fibrills only be observed at the centric and puripheric terminations as an indication of the fibrillar constitution of the exis-cylinder and its lines of molecular disturbances. If these protoplasmic processes and axis-cylinders be submitted to the action of silver nitrate in the dark, subsequent exposure shows them to be marked by a peculiar transverse striation, first indicated by Fromann.* Their significance is unknown.

(3) Medullated Fibre or Axis-cylinder Process. This may be either examined in the radiating expansion arising from the medulfated core of a convolution at the site of the spindle layer of cells; or, in the different intracortical arciform belts found at a higher level. The meduliated fibre of brain and spinal coed consists simply of an axis cylinder with an investing sheath of myelin, which gives to the modullated fibre its white appearance, non-medicilated fibres having a grey transitioency. The myelin is of fluid consistence, and appears limited simply by a very friable, noft, protoplasmic envelope (Cornil and Rauslert), and not by the strong resisting sheath (of Schwann) which invests the peripheral filtres. Külme and Ewald have proved, by the use of trypsin, that the axis cylinder is enclosed in a sheath of indigestable borny material, which they term the keratoid sheath. In the peripheral neeves, however, this keratoid sheath not only embraces the axia-cylinder, but, being reflected on the inner aspect of the sheath of Schwann, really serves to enclose the white medulisted substance or soyelin. In these more complex peripheral fibres (to which we must divert, for the time, our attention), although the axis-cylinder is continuous throughout, the medullary shouth is not so, but presents at regular intervals annular constrictions named Ranvier's nodes, after their discoverer. Ranvier called the individual parts formed by these constrictions interannular segments; and showed that, whilst covered externally by the resistant structureless shouth of Schwann, both were interrupted at these constrictions. In a depression of the myelin, and between it and the sheath of Schwann, are the nerve corpuscles one for each segment, consisting of an oral uncleus surrounded by a little protoplasm.

The neuro-kerstin sheath, spoken of above, lies therefore un the axiscylinder, and, reflected at each constriction upon the sheath of Schwann, enjoys the same argmentation us the other constituents of the nerve fibre. Traversing the medullated substance from the inner to the

^{*} Virebow's Archie, Bond xxxi.

⁺ Parisloyeni Himology, vol. i., p. 33. Trans. by A. M. Hart.

outer portion of the keratin sheath, are numerous transverse and oblique dissepiments, also of a herny nature, supporting the myelin (Loutersonne). At the annular constrictions, there exists a certain amount of comuning material, which, when the fibres are treated with silver nitrate, becomes darkened, and appears as a small cross at these nodal points along the fibres. The silver penetrating at these nodes stains also the axis-cylinder to a very limited extent, producing Fromann's lines. It is at this site that nutritive fluids gain access to the axis-cylinder, which otherwise could not be reached through the keratin sheath and medulia. Here also staining reagents gain admission, and colour the axis; and the myelin, after imbibition of fluid by the fibre, exades at these constricting rings, pressed out by the swellen axis-cylinder in the form of droplets, easily recognised by their spherical form and double contour.

The medulisted files of the central acryous system, however, possesses, as we have already restarked, no sheath of Schwann; it is consequently devoid of the constrictions or nodes of Banvice, has no internanular argments, no muclei along its length, nor does it exhibit any signs of Ranvier's cross on treatment by solver nitrate. The constitution of these centric medalisted fibres, therefore, leads to a more periodoble nature. They are for less registent than those of the peripheral nerves, break up more readily into myelin spheres, or became extensively corious. Hence, also, we find it difficult to stain such medallated fibres in fresh brain. The protoplasmic extensions take up smiline dye readily, becoming stained of a deep blue-black; but, where the meduliated abouth intervenes, the reagent fails to penetrate except along a short length just beyond the first appearance of the sheath. This want of permeability is compensated for, as before stated, in peripheral fibers by the presence of the constrictions of Ranvier.

To stain the active phase throughout its leagth in these centric fibres, we must first displace the myelin.* This can be effected by prolonged immersion of the section in water, and subsequent staining with aniline blue-black. Twelve hours' immersion usually suffices to remove the whole of the medalla around the axis-cylinders; and the latter are then seen as slightly wavy, swollen bands, often strap-shaped, and occasionally contorted, from the alteration undergone by aqueous immersion. They all run from the certex downwards into the core of the medalla, to which they converge in large numbers—deeply stained; and forming a striking contrast to the unstained aspect of never

[&]quot;In the very mante modulated filess of the coviet we have an exception to this pale—the axis-cylinder entaining fainly well without displacement of its investing myelin double a result due controlledly to the small subfer of the latter allowing a certain second of permeability.

elements at this site in sections which have been prepared in the monal. manner. But although such axis cylinders present difficulties in maining along their length, they are well seen in sections across their axis : such cross sections appearing, especially in the lowest layers of the cortex (spindle-cell layer), as a peased dark axis (often slightly drawn out into a short filament), surrounded by a shouth of white mobilla rotaining its circular outline-the myelin baving bean apparently "fixed" by the comium treatment. The medalls in these cases is not perfectly homogeneous, but has undergone a change which gives it a fewfod vitroous aspect, with a very slightly granular appearance, the diameter of the fibre being from three to four times that of the axis-eslinder." Large medallated fibres occur at this site, in section, measuring 13 a across, with an axis-cylinder of 4 a; but extremely minute fibres are seen intermingled with these larger forms also, if the field be carefully searched. As we shall see later on, certain morbid conditions of the cerebral cortex modify to a considerable extent the character of this envesting medulla.

(6) Blood-vessels of the Cortex—(i) Arteries.—These vessels, as they dip into the cortex, vary in dimensions from 4 µ to 12 µ. They possess the three tunics which are recognisable to the naked eye in large arteries elsewhere, the tenion aftentific, media, and intime; but, as in these larger vessels microscopic examination reveals the fact that each of these tunion is separable into several differently-constituted layers, so the larger cortical blood-vessels exhibit in the innermost coat a double layer—an elastic and an endotherial layer.

The intima, or lining membrane of the artery, in the feesh state appears as a structureless membrane at tabe, with numerous oral nuclei, well seen in commine stained preparations, scattered over its surface. These nucleus elements are disposed longitudinally, i.e., in the direction of the vessel's length. The action of a solution of silver nitrate (I per cent.) reveals the fact that this tunic is not a homogeneous tabe, but that it is constituted of large squareous excistheiral cells, which look like polygenal flattened scales, united to each other at their margin by a comming material, which is impped out in black lines by its reduction of the silver salt. Moreover, it is then seen that the avail carmine stained elements are nuclei of these flattened cells. The inner clastic tunic is, in the smallest vessels, a structureless membrane, seen as a bright wavy division between the endothelial and muscular cost in transverse sections of the ressel; in the larger arteries it is a distinctly femoment of membrane, the representative

[&]quot;It must be borne in mind that there exists a testale definite relationship laterest darmeter of accordingler and reminfiales should. He larger and symmetrialways having a larger should and our cores.

of Henle's fenestrated and clastic lamine, which can be stripped off in shreds from great arterial trunks like the carotic and asillary when they tend to curl at the edge and roll themselves up. It forms an important line of demarcation between the immunist and the muscular layer.

The tunica muscularis or media consists of smooth or unstriped muscular filter with oval or strap-shaped unclei. Such filters being arranged teamsversely to the long axis of the vessel, or, rather, coiling spirally around it, appear at right angles to the longitudinally-disposed nuclei of the intiesa. Where this temic is well developed, a longitudinal section of the reasel will often show these muscle fibres arranged in series along the margin of the tube, their nucleus, also divided transversely, giving them the aspect of round audiented cells. The limiting wall externally is also often thrown into slight wave outline from the projection of these numerilar fibres. In transverse sections of the small arteries one or two such muscle cells surround the open lumen. The muscular element does not enter largely into the constitution of the cortical blood-vexests. These vessels, like those of the cranial cavity generally, as well as those of the vertebral casal, have much thinger tunics than vessels of corresponding calibre sizewhere from this poverty in muscular elements and adventitial tunic (Sharper)

The tunica adventitia, which in the larger arteries is a connective sheath directly continuous with the pia mater (intiess pie), becomes in the smaller vessels an extremely delicate membranous investment, faintly striated or structureless, upon which are found connective corpuscies, the nuclei of which are round or somewhat oral. A membraneus nucleated tunics adventitis, similar to the above, can be readily observed in larger capillaries of the hysical membrane of the frog (Elenta"). The corpuscies in this adventitial sheath form a very delicate protoplasmic structure, of faultiers or stellate outline, shrinking notably with hardening respents and desireation of fresh brain, so as to bring their nucleus much more prominently into view ; in fact, mounted specimens usually show the nuclei only along the course of the adventitial coat. As we shall see later on, these naclei are people to extreme degrees of proliferation. Closely applied to the busies media, as a rule, this adventitial sheath is in certain conditions widely separated from the vessel's wall in amondur dilutations, and at all times leaves a space between it and the middle cost in the angle formed by the bifurcation of the vessel. The latter, with its shouth, traverses channels in the cortical substance which form a wall limiting the distension of the vessel. This limiting channel has no definite endothelial lining, so far as can be discovered by the sliver treatment;

^{*} San Stricker's Hamon and Comparator Hurology, vol. 1., p. 287, 52, 53

it is termed the perivascular channel of His, and is continuous with the epicerebral space between the intima pia and the outer surface of the cortex. Traversing this perivascular space are numerous delicate fibrillar processes, which, arising from stellate cells in the autotunce of the cortex, thus form connections with the adventitial aheath of the artery.

(2) The Capillaries.—These channels of interconsumication between artery and tein are of extremely fine calibre in the cortex. Taking the capillaries of all regions, excepting the encessors expillaries of marrow, we may state their average dimensions as between 7 µ and 10 µ—i.a., when fall of blood. The capillaries of the curves, however, are often not over 4 µ in diameter (gg/1g inch), and are therefore of less calibre than the red blood-corpuscle. We must allow for possible shrinking of the vessel by emptying its claumel, as well as for the constricting affects of reagents, and can scarcely conclude that even these minute ramifications do not permit the passage of the red blood-corpuscle.

The only constituents of the arterial tunics, which enter into the structure of the capillary, are the endothelial layer or intima and the adventitial investment. In fact, the transition from the smallest artery into the larger capillary is indicated by the disappearance of the nuncular fibre cell, and the continuation of the channel as an apparently homogeneous tubular monitorane, with oval nuclei along its course, and here and there nucleated connective cells as the sole representative of the adventitial sheath. The intima, which is a direct continuation of the endothelial lining of the arteries and by many believed to be the only constituent of the capillary, resembles that lining in every particular mave the number and form of its squamons. cells. These are not only fewer, being often reduced to two in a transverse view of the vessel or its lumen; but instead of being polygonal, are more often elengated into fasiform plates. These capillaries form good subjects for the study of this endothelial tube after the action of ailver nitrate. The darkened cement substancethen displays not only the outline of the endoth-fial plates, but various sized slits and darkened areas termed stigmata and stomata, and believed by some to imlicate orifices through which the colourless. corpuscies migrate.

In the smaller capillaries the delicacy of the structure is such that it is at first often overlooked until its course is noticed, mapped out by short, narrow, spindle-shaped nuclei, arranged alternately at regular distances on the opposite sides of the vessel. In the same direction also will be found received nuclei, staining readily with amiliar blueblack, semetimes aggregated into groups or arranged in linear series at very irregular intervals along the vessel. These are the derivatives of the adventitial sheath, and are therefore always external to and placed upon the /suffers model. They are often the best guide to the direction of the capillary loops around the serve cell (Plate xii.).

(3) The Veins.—The venous channels of the cortex call but for abort notice at our hands, since they reproduce with certain modifications the structures which enter into the formation of the arterial tunios. It will suffice here to show how they differ from the arteries, and to point out the distinctive characteristics of these three divisions of the macular supply—ortery, vein, and capillary.

The veins consist, then, of but three tunics—the Intima, Media, and Adventitis. The tunies intima is similar to that of the artery; but the endothelial plates are shorter and broader, and the nuclei rounded and fewer in numbers. The media contains no smooth muscle fibre cells, but consists exclusively of connective tissue, whilst the elastic element (always less developed in veins than in arteries) is wholly absent in the small veins of the cortex. The adventitia reproduces in all respects what has been already described as constituting this coat in arteries.

Thus we see that the veins may be distinguished from the arteries by the greater leading of their times—the absence of the nuscellar and clustic element leading to a miles fasses; moreover, the thin media, due to the absence of nuscle cells, results in a very thin-cooled cosel; in larger vessels the adventitia also is a more prominent feature than the corresponding cost in arteries.

The capillary, on the other hand, commences where the middle coat terminates; but to its minutest sumifications we still find elements of the adventitia around its delicate nucleated wall. This certain nuthorities deny, but repeated examination leads us fully to endome this view, also adopted by Buerth, whose views are so much to the point that we quote them here:—

- "Returns the expilarion of the hydroid of the Frog, included stellars collars on any such round made indicate protophera, beauting off into many processes, which often analyses with the processes of the cells of the trains adventitio. Towards the small arteries and trains, the periospillary please becomes contrastly closer, and man in its stend there appears a chilitate transcernely fished and analysed membrane, which is sumetimes elecated in the form of small conicles.

 . . . A similar unclosted membrane forms the outermost covering of the larger-sized capillaries, and of the arteries and verm of the heavy, spinal code, and retime of man."
- (c) The Neuroglia or Connective Basis.—Van more generally accepted functions of the neuroglia matrix would render structural differentiation of this non-nervous constituent highly probable in

 ^{**} Electle on the Minute Australy of the Capillanes," Strader's Wienegg, ed. 1, p. 286.

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different regions of the coreton-spinal system. This, we find, accords with actual fact; for, as a supporting, as well as embedding and protective material, the requirements demanded will slifter widely in the white medullated structures from those of the grey centres | whilstindividual sections of these territories will also differ in the special qualities of this matrix requisite. Thus, the large closely appear instead meduliated three of the Spinal Cord will be found to possess a strong binding material in the form of large-aired successed cells, with numerous lengthened ramifying processes, together with a plexus of fine fibrils (probably elastic fibre - Gerback) , whilst a structureless or very finely granular material is found here but sparingly. Still nearer the periphery of the cord, this amporting atmeture becomes a veritable Shrillar connective aheath of great strength, with trabecule of like constitution paining inwards to the ored. In the central grey matter of the cord, however, the finely granular or unlegaler basis-substance predominates, sa most essential for the pestection of the extremely deliente nerve fibres present in this region. Farther up in the medella of the from, as in the neighbourhood bordering upon the grey cortex, the large buildles of medaliated fibre again demand a predominance of the connective fibre element, so that here we must with numerous though delicate rassifying cells. Wherever the medullated tibes reappears, there we find the association of these branching cells, and thus they are seen along the outermost or peripheral layer of the cortex as a normal element. In the grey matter of the cortex, however, the delicate nerve-cell and fibre network appears largely to dispense with this modification of the connective tissue, and we find a structureless matrix vastly preponderating over the cell and madean elements of the neuroglia.

A still further modification of the neuroglia element is found on the free surfaces of the cortex immediately beneath the pis, where the branching cell before elemented fulfils the function of a fluttened epithelial investment, whilst the surfaces not exposed to pressure, as the central canal of the cord, show us the element as a columnar epithelium.

Thus, generally, we may affirm that, when desling with nerve cells and their delicate extensions, the supporting material will be chiefly the structureless or finely molecular basis-substance; whilst as we approach the medicilated tracts, we shall find that the connective cell and fibre networks increase at the expense of the farmer.

The elements of the neuroglis are usually described as nucleated cells and free nuclea inshedded in a structureless, or, according to some, finely thrimsted matrix, and to this view the appearance of chrome-hardened preparations certainly lends support. The less we subject our sections so reagents, and the more recent the section examined, however, the more evident it becomes that the supposed free nuclei are invested by protoplasm, and, in fact, are likewise nucleated cells. These two cell elements differ much as regards their relationships and also their dimensions.

- (1) The smaller of the two kinds of cell vary from 6 a to 9 a in diameter; have a spheroidal nucleus, surrounded by an extremely delicate protoplasmic investment, which, as before intimated, is shrunken, often beyond recognition, in hardened specimens. The nucleus is, proportionately to the cell itself, very large, and iscariably atoms of on intense olepth of colour with uniline blue-black. Those elements appear disposed in three definite situations—(1) irregularly in the nearoglis framework; (2) in regular series around the nerve cells; (3) in more or less regular succession along the course of the blood-yeards (capillary and arterials).
- (2) The larger cellular elements of the nearoglia are usually 13 a in diameter, and supplied with a relatively larger mass of protoplasm as compared with the nucleus. They are distinguished from the former not alone by this greater airs and the preponderance of cell over nucleus; but also by their frequent flank-like configuration, as seen in site, and the presence of a very faintly stained anciens, or even sometimes two or three nuclei, observed within them. If these elements are teaced out from the approunding matrix, they are seen to possess numerous extremely delicate radiating processes; not only the nucleus, but the cell and its extensions are likewise tinted by the author dye; not uniformly, however, for the nucleus is always of a slightly deeper tint, but neither cell nucleus nor processes betray anything like the vigour of staining shown by the former element described. The nerve cell, its processes, and the enclosed nucleus had, as we said, a special affinity for this staining reagent, a fact, which indicates very conclusively the someovers character of these larger elements of the neuroglia. In healthy brain, at least in the human subject, we find those elements chiefly in the outerment layer of the cortex and the central cone of the medulls, but their delicacy, tensity of branches, very faint staining, and peor differentiation are not favourable to their innuediate detection. In certain murbid conditions of the cortex, as we shall see later on, these elements become a most notable and important feature, undergoing excensive proliferation, and hetrasing their workid activity by the intensity of colouring which they anquire.

If now we appeal to the silver-chrone methods of preparation, the appearances are very diminisher. Two forms of cell obtensively present themselves in both the white and grey matter of the brain; the one with a poorly defined cell holly, obscured by much deposit of civer, throwing off on all sides short, shaggy, protoplasmic processes. dendritic or dichotomorally shiriding; the other, a cell element, also budly defined, forming a centre from which radiate outwards exceedingly fine shirile, often of great length, sharply defined contour, not dividing dichotomorally, nor presenting the thickened hispld aspect of the processes of the first described element. These exceedingly fine fibrile are characterised not only by their length, tenuity, and clean contour, but also by their tendency to exhibit many sharp angular bends along their course.

When the former element is more closely examined, we find the invariable presence of one or more lengthened thick processes by which the cell is attached to a neighbouring blood vessel; such proceases and in a sort of conical or flattened sucker-like thickening on the vessel's walls. We have here, in fact, modified by the silverchrome method, the same element described as the large cellular element of the neuroglia, and which, later on, we shall refer to as the spider cell. The second form, or stellate cell, has by some been regarded as a distinct element; it is found more particularly in the white matter of the brain, and under the pia covering the cortex. A point of great significance, however, is the fact that they lie invariably. in close contiguity to a blood-sessel, and that in favourable preparations, when the dense deposits of silver are dissolving off, we can identify them as spider or Deiter's cells, the vascular attachments being clearly apparent. Between these two forms, superficially so different, there exists a forther transitional element readily distinguished in most regions of the brain and medulla, but capecially beneath the intima pia, and which at once indicates to us the essential identity of the two former kinds of cell.

The transitional forms alluded to are strong beneath the pis, attached by a vascular process to a sensel of the latter, whilst from the central end of the cell, which is usually ovoid in form, a large number of extremely long delicate fibrils extend into the first and autipacent layers of the cortex, resembling in all respects those of the stellate cell just described. These fibres, however, arise from short standed pretoplasmic processes which are truly dendritic and hispid, and take their origin immediately from the cell body, whilst some of these fine fibrils process numerous monifiform enlargements along their course. To summarise, therefore, we find three stages of development presented by these elements, viz.:—

(a) Cells with short, thickened, mosolike protoplasmic processes, dendritic or branching dichatomensly, and possessing also thick taxvelse attachments;

(8) Long and exceedingly fire unbranched thrile radiating from an obscurely marked central cell, also (under certain conditions) showing vaccular processes;

(c) Transitional forms with vascular processes, about dendritic branches, from which are given off long delicate fibrils like those of the stellate cell, and often distinctly moniliform.

As stated elsewhere, we regard all spider-cells as destined to pass through the three stages—the embryome maniform, the fully developed spider-cell or "lymph-connective" stage, and, lastly, the stellate cell; whilst in normal develution the lymph-connective or spider-cell passes back into the fibre state of the stellate cell, losing its active functional manifostations, and assuming, therefore, the purely mechanical rife of a support for the blood-vessels and medullated nerve fibres in its vicinity.* This study of the constituent histological elements of the cortex prepares us for the consideration of the lymphatic system of the brain, and the ultimate relationships of Nerve cell to the Blood and Lymph channels.

(d) Lymphatic System of the Brain,—To Obersteiner is due the credit of first definitely indicating the existence and relationships of these lymph channels.† Their existence since then has been repeatedly denied, but the evidence hitherto brought forward against Obersteiner's views is most inconclusive in all respects, and in most cases apparently based upon incomplete methods of examination. This is not the place to enter on debateable ground; but we are compelled, owing to the supreme importance of the subject as affecting the physiology and pathology of the brain, to state the results of our own investigations, which were made the subject of a special memoir in 1877.;

All hardened cections of brain exhibit along the course of their blood vessels a distinct and more or less wide interval between the vascular walls and the brain-substance; in fact, the brain cortex is channelled throughout, in such a manner, that the vessels when contracted are embosed within a channel of much greater calibre. The disparity between the diameter of ressel and brain-channel will be affected undoubtedly by corrugating reagents; and hence, we never fail to find these channels disproportionately large in brain which has been subject to extremes of hardening by chronic acid, &c.; but recommon of the brain substance may occur from many other causes acting during life — notably extreme atrophic degeneration; and then, in like manner, such channels will appear inordinately large, however skillfully the besin be prepared. These channels are known

^{* &}quot;Structure of the First or Outermost Layer of the Combral Centes," Edia, Med. Journ., June, 1897.

^{4 &}quot;Cher einter Lymphratine im Orland" (Sittle & Aland & Wissearth, Jan. Heft, 1879)

^{2.0} The Relationships of the Nerve Colle of the Cortex to the Lymphatic System of the Resis." Proc. Rep. Soc., No. 182, 1877

by the name of the perivascular channels of the brain—the perivascular channels of His: there are not the tyoph channels proper, as
several writers seem to have supposed, but are simple channels in the
brain-substance, devoid of an endothelial tining, and communicating
freely with the space between the investing pis mater and surface of
the cortex, the epicerebral space. The adventitial sheath of the
blood-vessels becomes closely appressed to this limiting channel, and
its (adventitial) nuclei often thus give it the appearance of being
lined by endothelial cells. This, however, is not the case, as repeated investigations by allow staining have shown. The student
cannot too persistently bear in mind the fact that in these channels
he deals purely with what seems equivalent to an involution of the
maker surface are not continuous along this tubular channel.

In the next place we find, under precisely similar conditions to those above enumerated, a wide space around the larger nerve cells; the brain-substance, as it were, seems to have receded from the cell, so that it is enclosed within a circular, oval, or pyriform space. These spaces we will designate the pericellular sacs. Genuine sacs, soil not nerve artificial gaps in the brain-substance, they undoubtedly are, as a abundantly proved by careful examination. To exhibit the true relationships of these perivascular channels and pericellular sacs, letus revert to the smaller cellular element described in the seasonfile (p. 98). It was stated that beyond the scattered elements in the basis substance of neuroglia, these cells were arranged in two other directions. Let us particularise:—

- (1) The nonleased cells along the arterioles belong to the adventitial tunic, and usep our its course very accurately; occasionally closely applied to the perivasualar channel, as before stated, or separated as irregular ampallie from the reased itself, this investment more frequently lies directly upon the media, and affords one (but an equivocal) evidence of the existence of a lymph channel surrounding the vessel. That a complete tubular membrane exists for a certain distance along the smaller arterioles is demonstrable; that it is not tinuous, as a membrane, further on to the arterio-capillary pleasers, is more than dubious. It is certain, however, that its representative cells are to be found surrounding these minute channels to their ultimate ramifications; and thus, the perivascular (popula space of the adventitia becomes continuous in these districts with the general pervascular channels and sace around the nerve cells.
- (2) The nucleated cells found in connection with the nerve cell in certain states not only accumulate upon the nerve cell itself, but follow closely the outline of the cavity, or, properly speaking, the sac in which the nerve cell lies. Many pericellular sacs will show a

complete series of such nucleated cells around it, still more frequently will they follow out a segment only of its circular outline; occasionally none may be seen-an exception due probably to displacement during section-cutting or further manipulation. Upon closer observation, however, it becomes apparent that in the immediate neighbourhood of every large nerve cell there is a minute arteriols or capillary, not indicated so often by a well-differentiated contour (for these minute vessels are usually most difficult to follow) as by the direction of its nucleated cells. Thus, the fusiform nuclei of the intims, alternately placed on opposite sides of the capillary, will lead to the discovery of the outline of the vessel faintly indicated in a graceful curve or spiral in close approximation to the nerve cell; but the presence of the deepstained nuclei of the adventitial cells taking the same course, plainly indicates the direction of these ultimate nutrient channels. It is these adventitial elements which give us the clue to tracing the obscurely marked capillary, and when this is followed out, the eye becomes accustomed to trace without any difficulty the pascular lasy around the nerve cell.

Around a segment of the periodiular sac, mapped out by adventitial elements, we then see a delicate tubular loop, evidently continuous with the neighbouring arteriole, and to the sides of which the pericellular sac appears to be attached, the nerve cell itself teing, as it were, suspended within the latter. It would appear as if the general perivascular channels at their ultimate ramifications around the arterio-capillary plexuses were enlarged here and there laterally along the vessel by the growth of an element included within it which becomes the nerve cell, and which does not come in contact with the neuroglia matrix except through the medium of its processes, which, passing through the pericellular sar, permeate the neuroglia in every direction. It would appear also from examination of specially prepared sections, that the adventitial elements are not entirely limited to the vaccular loop, but may line the interior of these suce-not as a regularly applied endothelial layer, but as loosely distributed and branching cells. In like manner, similar cells may be found free within the cavity of the anc between its wall and the nervecell, resembling in all particulars lymph corpuscles.

Beyond the system of perivascular channels, adventitial lymph space, and pericellular sac, we have a lymph-connective system which plays an important cide in the pathology of the brain. This system is constituted by the larger connective element referred to above—the delicate branching masses of protoplasm supplied smally with one, sometimes with two, or even three large nuclei. Those elements, when more closely examined, are found, as already indicated, to have a definite and constant relationship to the cortical blood-vessels; and are always discovered in larger numbers in their immediate neighbourhood, external to the perivascular channels. The latter present, where they are well seen and the adventitial sheath is apprecised to the vessel's side, a series of delicate processes, which, traversing the channel, look like fibres extending from the adventitia into the brain-substance.

What are these fibrous prolongations? Careful examination of one of the large neareglia elements reveals the fact that they throw off two sets of process—(1) an encersous number of extremely delicate fibres, which aprend into the intervascular area around, and (2) a much rischer, courser process, which, often after a tertaous course, each in the extremitial should of the blood vessel. In crossing the perivascular sac, these processes give rise to the fibres just described as extending between adventitis and beain-substance.

It is in certain morbid developments of these cells that we can the more readily distinguish their real relationships. We find that the storter process, which we may provisionally term the vascular, terminates in a nucleated mass of protoplasm on the sheath itself, In morbid states, as we shall see, this terminal protoplasm of the easenfar process becomes spider-like, in its turn throwing off numerous branches, which emirace the vessel's wall. In the healthy state, it is most difficult to trace the vascular beanch; but that this can he done by proper methods, we have frequently satisfied curselves. The branched cells which we have now described have often been recognised in their morbid modifications, and variously interpreted Their representatives in healthy brain were first described by Deiters." and subsequently by Ball and Golgi; but we do not think their true algorifeance has been recognised either as aremal or pathological elements of the central nervous system. We incline to regard these elements as comprising the distal extension of a lymphatic system. in fact as a lymph-connective system permenting the neuroglia in the intervascular area. The individual elements are excessively delicate and pellucid, their protoplasm appearing almost of fluid consistence, and the vascular process invariably ostablishing its connection with the lymph sheath of a blood-vessel. In whatever assumer these apider cells affect the reabsorption and distribution of the effects material and surplus plasms whether by direct assimilation into their own structure, and its removal by currents within the protoplasm of the cell and its processes, or by means of a true canalicular system terminating in the lymph sheath-it is an undoubted fact that any arrest to the escape of perivascular lymph from the cortex is immedistrily followed by a morbid development and hypertrophic condition.

^{*}Hence they are elter assert after him—Delters' cells.—Cuterochemps after Gellers and Richmore's der Messchen und der Singerhire, 1865,

of this system of spider cells, as we shall for the future call these elements of the "lymph-connective system." Maynert long since strew attention to their frequent presence as an octated with congretion and degeneration of the lymphatic glassis of the head and neck, and we have assured conserves of the frequent association of this merical development in toberculosis, and in several affections of the cortex and its membranes which lead to obstruction of the perioacular lymph channels.) The morbid changes undergane by this lymph-connective system and the effects of its morbid activity will be more fully dealt with when treating of the pathology of the cortex.) For the present we shall summarise the above statements as follows:—The lymphatic system of the brain comists—

- (1) In the first place, of a distensible tymphatic shouth, loosely applied around the arterioles and vennion, containing numerous nucleated cells in its texture—the advantital (ymph about, the whole being included within a non-distensible channel of the brain-substance, devoid of endothelial lining—perioscular channel of His.
- (2) In the second place, of a continuation of the cellular elements of this sheath, loosely applied to the arterio-capillary plexuses, still contained within a perivascular clumnel, which now exhibit along the capillary loop suc-like dilutations—the periodical uses, within which the nerve cell lies, surrounded by plasma.
- "It may pure of interest to give here references to some few of the articles bearing directly apon phagocytanis ..." Powerson and Defension Albamone," by De Hankin in Brit. Med. Journ., May, 1890, p. 198. "Lectures on Plagocytoms and Immunity," by Suns Woodbood, Lancet, Jain, and Feb., 1892. "Discussion on Progreytoms and Immunity," Brit. Med. Journ., Feb. and Max., 1892. "The Spiler two-alled Scarcegory Cell of the Resia," by Estern Goodall in Journal of Particlogy, Feb., 1888. "The Spiler or Phagocyte Cells of Scale Intentity, General Parallysis, and Alcoholic Beautity," by Affred Campbell Journ. Montal Sc., Oct., 1994.
- "We have elementer allowed to the comparative significance of these elements in follows:—" In most they appear in scardy varieties; in the Burbary ape, they become more frequent; in the out and uselet, they are will more abundant; in the pig and sheep so producelly existenced are they that they been a most characteristic stratem immediately below the pix mater, and the mechanic formed by their three to done and course, binding the blood result to the cortex and readering the pix mater strongly inflormed. We find those respected to format brain which has analogues made degeneration to takes dismans attended by preduction in functional activity, and is vacually affections resulting in retrogressive changes and a reversion to a low type of structure."—" Comparative Structure of the Cortex Corebes." Trans. Royal Soc., part 5, 1880.
- 2 See to this connection a suggestive article by Dr. Shaw on Apocasia of Children a condition where advanid growths (post pharyugosi) obstruct the flow of Lymph from the frontal line, which naturally escapes through the lymphatics of the ethanoid plate — Practitioner, July, 1890.

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(3) Lastly, of a system of plasmatic cells with numerous prolongations, which are always in intimate connection with the adventitial lymph sheath, and which drain the areas between the vascular branches; these we have bruned the tymph-consection element.

If we take a comprehensive view of the whole system—the channelled vascular tracts, the secoular ampallie along the capillary tube, the causalicular-like formation of the lymph-connective elements, all embedded in a homogeneous matrix of neuroglin—we cannot but be struck by the space file arrangement of the cortex, and the facilities so afforded for the free circulation of plasms throughout its most intimate regions.

CORTICAL LAMINATION.

Having familiarised himself with the individual histological elements of the cortex—the nerve cells, blood vescular and lymph vascular systems, and the acurogila framework—it becomes the student's duty to examine their general arrangements and the local deviations to be observed.

A vertical section of fresh certex of human brain reveals to the naked eye a distinctly laminated aspect, the various lamine of which are more or less clearly marked out by difference in colour, the outer being usually of a pale translucent grey, and the deeper of alternating pale and dark grey layers, more opaque in aspect, and in certain regions exhibiting a sharply-defined white streak. The outer translurent layer has superimposed on it a delicate white strutum, scarcely appreciable on the convexity of the hemisphere, but well-marked in the convolutions bordering upon the corpus callowin, and the convolution of the hippocampus, at the base, where its peculiar aspect has gained for it the same of the reticulated white substance. As we shall see later on, this is a superficial layer of white medullated filtre running purallel to the surgion of the convolution; whilst the paler intersecting streaks desper down in the cortex are similar systems of arciform intracortical fibres intervening between layers of grey substance. The deeper layers ove their queity to the relatively large proportion of medullated fibres pussing through them; the open layers are translacent from the prependerance of the neuroglia element and fine protoplasmic processes of the nervecells; the warmer grey tints are due not only to large numbers of pigmented nerve cells, lert chiefly to the amount of blood in the venicle of the layer.

As might be supposed from the above, the distinctness of lamination not only varies with the local poculiarities of structure, but with mortial states of the cortex and with the full or empty state of its reason. Probably the best introduction the student can have to the atudy of the human cortex is an commence first with the brain of one of the lower mainmain choosing one of the smooth non-convoluted leader, as of the rat or rubbit, ere he attempts the more complicated beain of those animals which exhibit a convoluted surface. He thereby learns to appreciate the great diversity of lamination which may exist in so small an organ as the brain of the rodest, as also the atrust transition from one type of cortex to that of another wholly different from it, and lastly he becomes familiar with types of lamination which are strictly reproduced in higher forms up to the brain of man.

Figs. I-3 in Plate it represent the brain of the rabbit seen from its upper, lower, and median aspect, of somewhat pyriform contour below at the base, and triangular above; its frontal pole is much attenuated, and rosts upon the elfactory labs. On its inner aspect we see two very delicate furrows (fig. I. A) which represent the sub-frontal and sub-parietal segments of the limits finance, which is attengly marked in the braits of the pig and of the above; this radimentary finance limits the upper limbic are (between A and J) from the extralimbic or parietal mass of the hemisphere (fig. 3, Z, Y).

If we follow this upper limbic are from before backwards, we find that its anterior extremity is deep, and that it gradually becomes some shallow towards the sub-parietal farrow; beyond this it is hollowed out by the prominence of the mesencephalon and overlang by the scopital pole (fig. 1, D), and curving downwards behind the corpus callorum, it bends forward as the gyrus hippocnessi or lower limbic are (figs. 1, 2, B).

Looked at from the base, we see the lower limble are separated from the extra-limble mass by a well-defined toware—the limble fishers, which here separates the lower limble are from the extra-limble mass, the latter being still prominent and set concealed from this sepect, as in the rat, where the lower limble are extends farther outwards. Extending back from the frontal pole are the olifictory lobes, the outer roots of which (or superficial olihetery medialla) terminals near the extremity of the gives happocamps. These two external olifictory roots enclose between their two pyriform grey areas, one on each side, separated by the middle line, bounded behind by the optic commissure—the optic nerves lying superficial to them. This grey area is the olifectory field of Gratiolet. Between the olifictory area and the lower limble are, a very slight depression indicates the site of a ruilineartary Sylvian figure.

Looked at from above, we find the surface of what Broca would call the extra-limbia portion, perfectly smooth, and showing no indications of rudimentary forcowing beyond a very delicate, shallow, linear depression, mapping off the sugistal region of the brain from the parietal or extra-limbic portion in the posterior half of the hemispheres. This is the representative of the primary parietal sulcus, which in the Pig. Sheep, and other Gyroncephala, reparates the sagistal from the sylvian gyri of the parietal lobe. In the ret no such linear depression exists; but, this region bordering on the sagistal margin posteriorly, is elessly mapped out by its distinctly pair mapper as compared with the vertex external to it.

The different regions which we have now indicated are all distinguished by a type of cortex peculiar to each; and thus the upper limbic are, the lower limbic are, the olfactory area, the extra-limbic or justictal portion-areas obviously differentiated roughly from one another by sulti or faint indications of furrowing-all exhibit absolutely distinct types of cortex. But this differentiation does not stop here; the pale strip of cortex bordering upon the sagittal margin in the rat. although not mapped off by a distinct furrow, has also its own peculiar. type of cortex; and in the rabbit, as we have seen, this region is further differentiated by a linear furrowing. Then, again, the lower limbic arc, if traced backwards, presents us beneath the occipital polewith a further modification, which can only be regarded as a distinct type of cortex. If we aid to the above the formation of the corns Ammonia and of the elfactory bulb, we have presented to us wash distinct types of cortex, not more fanciful distinctions based upon trivial peculiarities; but, in all cases, abrest framerious from one hind of cortex to another. This divergence in fundam type is peculiarly abrupt in these lower forms of life, the dessacration usually being sharply drawn at the farrows intervening between these regions. In higher animals, and especially in man, no such abrupt demarcation occurs; distinct transition regions lie between either territory, tothat the gondreal passage from one flow of cartex to another is a dislipctive element in the evalution of the higher brains " (Brain, vol. i., page 84). The eight liminar types of correx which are thus distinguishable in these small mammalian brains, we have named as Sallows :-

- (I) Type of the upper limbir arc.
- (3) Modified upper limbia type.
- (3) Outer olfartery type.
- (4) Inner olfactory type.
- (5) Modified offsetory type.
- (6) Extradintalo rype.
- (7) Type of corns Austonia
- (8) Type of officeupy bulls,

^{*}To be earlier measure, published in Stricker's Homeomod Françaistics Histology, as well as in his later views expressed in Psychotry. Mayners dichose but five types of certical lumination as distinctive of the train is maximals. We find ourseloss makks to agree with Meyners, not only as regards his measuration of types of lumination, but is some cases as regards his description of the specific elementers of instrudent types of certics.

On the other hand, we find that Meynert enumerates hat five types as follows:-

(1) Common type: (5) Sylvian type.

(2) Occipital type. (4) Type of corns Aminonia.

(5) Type of offsetory bulb.

In addition to these types of certical lumination we have also to consider the cerebellar cortex, and what is really an offshoot of the cerebral cortex—viz., the retina.

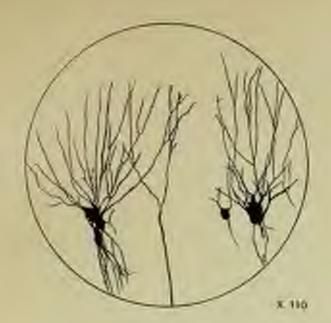
If we turn to our cutline scheme of the rabbit's brain (Plate i.), we shall find these diverse forms of cortex distributed in the following regions:—

- (i) The first, or the type of the upper limble are, occupies the median cortex of the hemisphere from the frontal pole to the end of the sub-parietal forces (figs. 1-3, +); it moreover apreads beyond the sugistal energin, and embraces the pointed frontal extremity of the extra limbic region at the vertex.
- (2) The second, or modified upper limbic type, prevails also on the median cortex behind the above type, extending to the cocipital pole, but also spreading outwards over the agental border to the upper aspect of the less appears, where it terminates already at the parietal furrow (dotted area).
- (3) The third, or outer offactory type, characterises the cortex of the greater regment of the lower limbic are to its extremity—the gyrus hippocampi (figs. 1, 2, B).

(4) The fourth, or inner olfactory type, covers the grey pyriform areas enclosed within the last mentioned and the outer root of the effectory bulb (fig. 2, dark area).

(b) The filth, or modified offsetory type, occupies the posterior asyment of the lower limbic arc, where it aweeps round posteriorly to meet the upper limbic arc. This form of cortex, unique of its kind, in also abruptly limited externally by the great limbic finance.

- (6) The sixth, or extra-limbic type, is peculiar to the whole of the extra-limbic or pursetal portion of the hemisphere, except the regions already described as presenting a peculiar lamination. Thus it occupies the whole of the vertex except the portion internal to the parietal facrow, and the pointed and of the hemisphere in front, whilst cliewhere it is strictly demarcated from other regions by the great limbic fissure.
- (7) The seventh, or type of the cornu Ammonia, characterising the involuted free margin of the cortical savelope, is, of course, concealed from view in these aspects of the hemisphere.
- (8) The eighth, or type of the olfactory bulb, has its distribution sufficiently indicated by its name (figs. I, 2, F).



Fro. L.



Fra. 2.

X 110

CORNU AMMENIS OF YOUNG RAT. SHOWING PYRAMIDAL CELLS OF CORNU, AND GRANULES OF FASCIA DENTATA



A brief description of the peculiarities of these cornical belts of nerve cells will be all that is needful for our present purpose.

 Upper Limbic Type. —The certical lamination here referred to is illustrated in Plate i. The area it covers is represented in figs. 1-3.

It is essentially a four-laminated type; its first or superficial layer being a light grey belt of delicate neuroglia matrix, with connective elements and their the prolongations supporting the extremely delicate subdivisious of the spical processes of nerve cells in the subjacent layers. This layer we term the "peripheral cortical zone" (Plate 1.) Next to this succeeds a layer of small preamidal cells, which down to the confines of the third layer, remain equable in size throughout; in all sespects these elements been close resemblance to the upper half of the third layer in higher animals. They differ from the buman cortex (1) in not, as in the latter, rapidly increasing in size with their depth, and (2) in following immediately upon the peripheral certical zone with no intervening belt of small oval and angular cells, such as characterises the second layer in man. A few bifureste cells in sparse detached clumps occur on the outermost confines of this layer, probably radimentary elementa of the second layer of man. Beyond the layer of small pyramidal cells is a pale belt containing the largest cells of the cortex -a pale poorlycelled zone demarcating them from the superimposed layer of pyramidal cells. These elements are, however, distinguished from the latter not alone by their great size, but by their distribution into confluent groups or clusters, which, as we shall see later on, is a special character of the large nerve cells of the motor cortex. Their apex process extends right through the pyramidal series into the perioberal none. We cannot now stop to inquire into their many striking features. Beneath these large cells in a series of funform elements similar in all respects to those found in higher mammals. This type of ourtes, therefore, is constituted by

- (1) A peripheral cortical cone-
- (3) Gauglionis layer.
- (2) Small pyramidal layer.
- (4) Spindle cell layer.

(2) Modified Upper Limbic Type.—This form of cortex, like the last is also a fear-inminated type. Near the posterior extremity of the corpus callesum (Plate x., fig. 1), the opper limbic are exhibits the intercalation of a series of granule cells between the small pyramidal and the large gaugitonic cells; but, as we proceed farther back, this belt of granule cells deepens, and, approaching the surface, eventually entirely displaces the small pyramida, and becomes in their place the second layer in this region. The granule-like supert is due to the relatively large nucleus, as compared with the investing protoplasm: they form a helt of densely crowded elements. The cortex, therefore,

of the area represented in Plate x. (figs. 3 and 3, slotted area) is constituted of

- (1) Peripheral cortical rose.
- (5) Garglionic belt.
- (2) Deep belt of granulo-like cells.
- (4) Spindle rell layer.
- (3) Outer Olfactory Type, -Passing now to the lower limbic are at the base, we find that the area marked Plate i., B, has a much simpler form of cortex than those hitherto described-two beits of nerve cells only are found in this region subjacent to its outer or peripheral zone. This peripheral cone is specially characterised by the distribution throughout its greater extent of fibres derived from the superficial olfactory fusciculus, which lies embedded in this first layer of its cortex; fibres which ramify at all depths in this layer to unite with the meshwork derived from the spex processes of the cells beneath. Next to this succeeds a shallow belt of irregular cells, pyramidal. oval, or fusiform, small in size, such with a befureate agen process, which immediately undergo rapid subdivision. They are arranged in peculiarly appressed clumps. Then amongst them appear a few large cells of pyramicial contour, which deeper down increase in number and form a distinct belt, in which a few rather large elements are seen. Traced outwards, beyond the limits of the great limbic fixaure, these larger elements appear to pass into the ganglionic series, whilst the small change of irregular cells pass into the small pyramidal cells of the extra limbic region. This cortex, therefore, comprises
 - (1) A peripheral cortinal zone.
 - (2) Dense apprensed clusters of small cells.
 - (3) Scanty large pyramidal cells.
- (4) Inner Olfactory Type,—Covering Gratiolet's "elfactory area." is a three-laminated cortex, comprising
 - A peripheral zone.
 A granulo cell layer.
 Layer of spindle cells.

The second layer is formed of cells measuring 9,a × 5,a, with a large spheroidal nucleus, 5 s in dismeter; with these are associated numerous minute granules only 5 s in diameter, like the granule cells of the modified upper limite region. This layer is duplicated in numerous folds, in which the outer layer does not participate. The layer of spindle cells is notable for the large size of these elements; they are rectinate—i.e., their long arm ties parallel with the surface of the cortex.

(5) Modified Lower Limbic Type,—This unique formation, compying the small triangular area, shown in the figure (Plate i., T), is a five-laminated type, the shief feature of which is presented by the peculiar second layer of cells. These recesses elements are more than double.

the size of those occurring in the accord layer of the cortex elsewhere; they are large, avoilen, globous, inflated-looking cells, which almost invariably branch from the apex by a hind or bisorned process. This belt of inflated cells is appringosed on a series of analy pyramidal bodies, which asconds them (Plate c., fig. 2). A pule belt, devoid of nerve cells, follows the latter, and is in turn succeeded by a series of spindle cells. To recapitalists, we have here

- (1) Peripheral certical sone. (5) Small pyramidal cells.
- (2) Layer of globuse inflated cells. (4) Pale belt denoid of zeros cells. (5) Spindle cell layer.
- (6) Extra-Limbic Type differs from that of the upper limber cortes solely in the interculation of a belt of granule or angular cells between the small pyramicial and gaughionic series. This form of cortex exhibits a very gradual transition to the upper limbic type, and, therefore, presents an exception to the rule of abrupt demaration above by other varieties of cortex. The gradual passage of one into another form we shall have reason to refer to later on; for the present, it will suffice to enumerate the relative layers of this formation.
 - (1) Peripheral certical sons. (3) Belt of granule or angular cells.
 - (2) Small pyramidal layer. (4) Gauglionto series.
 - (5) Spindle cell series.
- (7) Type of the Cornu Ammonis,—The cortox of the cornu presents several features common to other regions of the hemispheres; we here have reproduced a peripheral cone to which run the radiate apex processes of underlying cells; then a dense belt of gargianic cells; beneath which again we trace a spindle-form series of elements. The distribution, however, of these several nervous constituents is so far different as to stamp this type of cortex with features psculiarly its awn.

Peripheral Zone (Limining Zone or Molecular Layer) — This imperficial layer receives the terminal dendrates according from the subjacent pyramidal cells of the booth layer, and the terminal ramifications of axons also derived from subjacent cells—ascending axons. Apart from these, however, we find according to Cajal, certain nerve cells proper to this layer—cells of finiform or races or less triangular form, with several dendratic tranchings, whilst a fine axon ramities very extensively through the whole thickness of the stratum. Mayners recognised spindle-formed cells in this his "Nuclear layer.

The cells whose axons enter into the constitution of this peripheral cone are the nerve cells borizontally disposed within the second layer the so-called "lacunar layer" of the coran; as well as the polymorphic cells of the fifth layer, lying just beneath the buls of pyramidal cells. Lecurer Layer,-This, the second layer of the corns Assistatis, is formed by

- (1) Horizontally disposed medulisted fibres, the origin of which has been traced to the large size collaterals ascending from the axons of the giant pyramicis and ramifying across the primary dendrites of the small pyramicis, which run vertically at this level;
- (2) Terminal arborisations from collaterals ascending from the white matter or alveus;
 - (3) Terminal arburinations of the ascending axons of subjected cells;
- (4) The intrinsic cells of this layer, usually triangular in form, passessed of several deadrites, and an axon which terminates in an arborisation horizontally distributed along this layer, losing itself, as before stated, in the lower region of the puripheral zone.

Striate Layer.—This is the part characterised by its endinte appearance due to the escent of the dendrons of the pyramidal cells. Several species of nerve cell are found in this layer, distinguished by the distribution of their axons. All have dendritic expansions, which are distributed to the two upper layers on the one hand, and to the layer of polymorphic cells on the other. All such cells give origin to axons which ramify extensively; some upwards into the two superficial layers; others borizontally within the striate layer; and, lastly, others descending to end in free arborizations around the pyramidal cells and the subjected polymorphic cells (Cojal).

Paramidal Layer,-These nerve cells, so characteristic of the cortex of the corne Aumonia, vary much in form in different animals; they are closely apprecised and often appear in several tiers one over the other. More frequently aval or spindle-shaped, they, at times, assume a more spherical contour; but, in all cases, whilst several protoplasmic processes descend from their base, an apical dendron ascends towards the peripheral zone. This latter throws off several collaterals on its ascent through the striate layer, and upon its arrival at the lacunarlayer, its primary splitting up into dendrites occurs, and a rich terminal planto results, whose branches extend up to the peal surface of the cortex. Like the corresponding pyramids of the cerebral cortex these deplrites are covered by rough thorny projections. The axon of these pyramids (long known to be continuous with the medullated three of the alveus) descends to the white stratom below, throwing off several collaterals in their course, and then, bending at right angles, becomes continuous with the medulis of the alvers-many hitercating into two branches which run in opposite directions.

A very important distinction must be made between the inferior or giant premaids near the finhesis, and the superior or small-sized pyramids beneath the alvers as regards their conformation, relationships, and functional significance. The former are not only larger in size,



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Fri. 2.



have thicker dendrous with atomted dendritic arborisations, but also their axons are continuous with the fibres of the fimbria, set with those of the alvers as is the case with the smaller pyramids; at the same time these axons originate the recurrent collaterals already alluded to, which pass through the lacunar layer to ramify over the primary describes of the smaller pyramids. A further distinction is established by the fact that the axons of the granules of the faccia dentata (moss fibres) are brought into close relationships with the dendrous of these giant cells alone and not with those of the smaller cells.

Polymorphic Cells.—The irregular and funtform cells beauti the pyramidal layer constitute the "polymorphic layer" of Cajal—the old "stratum redeculare" of Kupfler. Formerly classed as simple spinileshaped cells recent authorities describe retrain notable features as presented by them. They may be divided into three groups—all the cells of which are dendritic—these dendrites ramifying amongst the protecularnic processes and the collaterals from the axons of the pyramids. These groups are characterised as having—

- (I) Ascending and recurrent axons;
- (2) Horizontal and plexiform axons;
- (3) Deep spindle cells with ramifying axons.

In the first group of ascending and recurrent axons this process ascends through the radiate stratum, throwing off occasional collaterals in this course, some of which pass up into the incurar and peripheral layers, whilst the main axon curves downwards again and, passing into the pyramidal layer, forms a rich terminal piexus of fibres around these cells. In the second group, the axon passes off horizontally and divides into numerous tranches after the manner of Golgi's sensely cells. From these originate collaterals, which ascend to the pyramidal layer and surround its cells with a plexus of branches mingling with the similar plexus from the recurrent axons.

In the third group, the cells are spindle shaped; they have long been recognised in the neighbourhood of the alveau, but only recent research has revealed the fact that they possess axons which ramify extensively in this stratum and ascend apwards to a higher level.

Besides these three, Cajal describes a cell which gives off an accessing axon terminating by ransification in the licenser and perigheral layers, but having no recurrent branch. We need scarcely include here certain cells, as Cajal does, which, together with others in the stratum radiatum, are admittedly similar in type to the pyramical cell, and are really elaborated cells not special to these layers, any more than we should speak of those cells found in the lowermont stratum of the peripheral layer which are really elements dislocated from the cells of the second layer of the cerebral cortes, and which are also seen in the region of the fascia dentata.

Maintinual Layer or allows.—This deepest layer, bounded centrally by the epondyma of the centricies, is largely constituted by the axons of the pyramidal cells, many of which, as before stated, bifurcate into a thick and a slender process sunning in an opposite direction. These meduliated fibres throw upwards collaterals which ramify in the upper layers of the comm.

The Fracis Destate. In this region we have to distinguish three

layers, viz :-

(1) Peripheral or molecular;

(2) Granule layer or small pyramids;

(1) Polymorphic cells.

Molecular Layer.—This, like the corresponding layer of the cortex generally, and that of the cornu Ammonis formation proper, occurs the terminal plume of dendrites given off from the subjacent cells, and which are here brought into relationships with the axons of certain nerve cells pseudiar to this layer. These cells are distributed in a double series, superficial and deep (Cojed); they are ovaid, stellats, or spindle-shaped—the deeper cells being the larger and more freely supplied with protoplasmic processes. Both have an axon thicker in the deeper cells, and ramifying to great distances in a horizontal direction, but much finer in the smaller cells and far more restricted in range.

Stratum Granologous.-The elements of this layer are very small, densely appreciaed, forming a deep stratum of minute ovoid, peramidal. cells, thereing of numerous protoplasmic processes towards the verisheral zone; whilst its axon, descending through the subjacent laver of cells (polymorphous), gives origin here to numerous distincte collaterals, which ramify amongst the polymorphic cells. Continuing its course, it bends as a knotty, non-medulated fibre along the length of the cornu, upon the body and dendrons of the gint pyranids. These axons from the granules appear similar in all respects to the so called "moss fibres" of the cerebellum. Cajal affirms that each moss fibees never truspass on the region of the alvens or the lacenar layer of the cornu proper; but are invariably confined to the giant permaids, their moss-like banches resting in close contact with these cells. It will be observed that these axons of the granules form a terminal prherisation, bringing them into relationship with the giant peramids and their dendrons, just as the collaterals ascending from the axons of the latter ramify over the dendriter of the smaller paramids of the corne.

Pyramidal cells of notable character occupy the upper regions of this granule cone. They have an apical process (protoplasmic), which arounds to be distributed in branches to the molecular layer; several protoplasmic branches given off from the base of the rell, and an axon which running hiercontally immediately above the granule layer sends downwards numerous collaterals to envelope the granules in a rich plexus of branches.

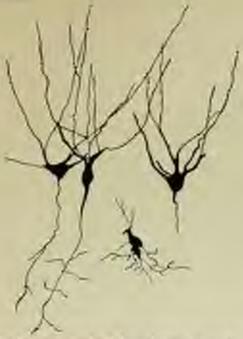


Fig. 14.—Cerebral outen : granules of fascia desinta.—Cores Americas (rabbits,

Strutum of Polymorphic Cells.—Irregularly shaped cells are soon beneath the granule layer, throwing off pretoplasmic processes in several directions, and with an ascending axon passing upwards through the granule into the molecular layer, there so bifurcate and ramify in extended horizontal planes. Some of these cells are stated, however, to give off an axon which runs horizontally along the assumit of the granule zone, taking part with the pyramidal cells in the formation of the intergranular planes already described. Cajal, moreover, describes in this layer serve cells similar to the sensitive cells of Golgi; and others with a descending axon continued into the alvens. Lastly, immediately above the incloudar layer of the cornu proper, where it is concealed by the fastia dentata, are large fusiform cells, whose axon can be followed into the alvens.

The Offactory Bulb.—The certex of the offactory bulb consists of a superficial and a deep fibre-tract; the former non-medullated, connecting the nervous apparatus of the Schnederian membrane with the offactory bulb; the latter, medullated, and connecting the bulb through the offsetery tract with the centric teresmi in the corebral sorter. These two tracts of news fibre are brought into relationship through the medium of the intervening layers, three in number, of nerve cells and fibre systems.

We have thus, from without inwards, five distinct strata :-

- (1) Flexus of peripheral nerve fibres.
- (2) Layer of olfactory glomerali.
- (3) Molecular layer with small nerve cells.
- (4) Layer of so-called "matre cells."
- (5) Layer of granules and medallated nerve fibres.

The superficial layer of the built is formed by non-nedalisted fibers which, arising from hipolar nerve cells of the Schneiderian membrane, pass through the crabritorm plate to form a densely woven plexis, on the surface of the built; the fibres eventually terminate by a free arborisation in the interior of the glowershi which from the characterlatic feature of the second layer of the ball. These spheroidal bodies were first observed by Leydig in the fall, and constitute Meynert's "atratum glomorulosum." Each glom-rulus consists almost entirely of the interlacements of the elfactory fibres derived from the superficial layer on the one hand, and, upon the other, of those derived from the cells of the fourth layer; whilst a few nuclear-like cells are found within and around the glemernius. The silver-channe method shows that the non-medullated filter on entering the glosseralus split up into arbonisations of excessively fextous, thickened and various fibrils (Cojef), which never again emerge from the glomernius. Here they intertwine, but do not incorniate, with a rich arbonisation of dendrites derived from a process of the cells of the fourth layer—the so-called "mitre-cell." Issuediately hereath the glomerular layer is a stratum of finely granular material, in which are imbedied small famform nerve cells which throw off a course protoplasmic process (dendron). towards the giomerulus, in the interior of which it form itself as a doublistic arborisation. An extremely fine ason passes from the rell deeply towards the granule layer of the bulb and, bending at right angles, passes tookwards amongst the medallated fibres of the tract.

Layer of Note Colls.—Between the precessing and the despent layer of the bulb-lies a stratum of cells, remarkable for their site, configuration, and relationships. These elements are usually of large size, of mitre-like form, throw off lateral processes ramifying through the neighbouring unlevalar layer, whilst, from their lawer aspect descends a coarse dendring, which, entering a glomerulus breaks into a terminal ramification of dendrites interlaring with the officiory nerve fibres, as already notes! From the deep sepect of the mitre cells a stort axon passes upwards to the granule layer, and here, bending backwards,

becomes continuous with a meduliated fibre of the olfactory tract, for distribution to the persbral cartex. In this course through the granule layer, the axon throws downwards several vertical collaterals, which ramify in the molecular layer (You Gelm'Aten and Morris).

Layer of Granulis and Medallistet Piters.-This, the deepest layer of the grey matter of the built, is of considerable thickness, and is formed by granules similar in form to those of the cepebellar granule layer, but separated into compact groups by the passage of fasticuli of meduliated fitees. According to Cajal and others they differ morphologically from the granules of the rust-coloured layer of the corebolium; these possess a distinct axis evilinder, while those of the olfactory bulb are devoid of such." These spherical or angular cells throw off two processes; one downwards to the mitre layer, where it ends in a terminal plume in close contiguity to the lateral dendrons of the mitral cells; the other, far less compinious, passes inwards to ramify amongst the granule groups at a deeper site. The terminal dendrites of the peripheral plume are thickly beset with minute spiny projections along their course, like the similar formations along the terminal plantaics of the pyramidal cells of the corebrat cortex. The peripheral denieon is always present; the central dendron may be insignificant or altogether wanting (Pafes Rasson). Golgi has, moreover, described large alsed stellate cells sparsely scattered in the granule layer, which, besides protoplasmic processes, possess an axon which (according to Cajail) always ends in a rich arborisation within the molecular layer of the bulb. The meduliated fibres found in this deepest layer of the built consist very largely of the axons derived from the mitre and small furiform cells; but also embrace medalisted fibres which pass from the brain to the bulb (contriligal), and end in free ramifications in the granule layer.

The Retina.—The serve elements of the retina consist of a superficial layer—the well-known rods and cones; of an outer and inner granule layer, separated by outer and inner pleasform relational fields; and of an innermost layer of ganglionic cells and optic nerve fiters. The rods and cones of the superficial layer are morphologically centinuous with the elements of the outer granule layer, but are usually, for convenience, described separately. The inner granule layer differs essentially from the outer not alone in the conformation of its constituent elements—the granule cells, but in the presence of two other nerve elements—the horizontal cells and retinal spongieblasts; whilst the outer granule layer is a comparatively simple

[&]quot;This opinion, which has given rise to the doctrine of "amacrine sells," or more cells without anis-cylinders, appears to us to be satisfactorily confuned by the Hill, who has discovered the accessed figured it. See "Notes so Granules," by Alex Hill, Sveis, vol. xx., p. 155.

structure—the inner is much more complex and may be subdivided into these layers:—

- (a) Superficial horizontal colla ;
- (b) Bipolar granule cell;
- (c) Spongiohlasts of the deepest stratum.

Lastly, the inner plexiform or relational field is one of very great complexity, embracing, as it does, the ramifying branches of the bipolar granule rells, the dendrites of the ganglionic series, and the branches of the retinal spengioblasts,

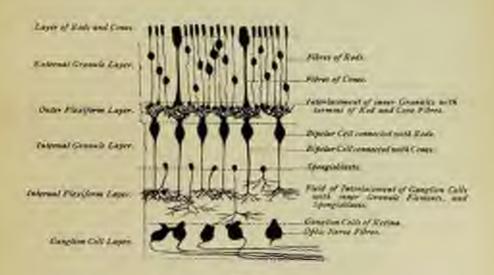
Revised Rods.—The rods are cylindrical bodies, fore in mammals and accturnal birds (in man 50 a to 60 a long by 2 a thick, according to Max Schultze); but of large size in Barrachia, diarnal birds and falses (Cajat), consisting of an inner segment or body, and an outer segment perfectly cylindrical and unpointed. Unlike the cones they are not attached directly to the body of the granule cell of the next layer, but through the medium of a peripheral process extending from the latter; so that the granule cells of the rods resemble a bipolar gaughies cell, of which the finer or centric process extends to the outer plexiform layer. Here this process ends in a small apherical swelling embesced by the dendritic peripheral branch of the cells of the deeper granule layer. The rod fibres are always finer than the cone fibres.

Refinal Conce.-The cone, always shorter than the rod, comists of a flask-shaped body or inner segment, about 6 a in thickness, terminated in a pointed-conical extremity; and an outer segment, which is more strongly refractile than the inner segment. Schultze has described a longitudinal striction of the outer segment of both rods and copes in fishes, amphibia, and mammals, including man; and likewise a similar striction of the inner segments in man and mammals. The body is distinctly continuous with the granule cell of the cene-an ovoid body with large nucleus, from which a centric process descends to the outer reticulated or plexiform layer, where it ends in a conical swelling with a few lateral free fibres. In reptiles the rode are absent, the cones alone being found. It is interesting to note that Krause has shown that the rods and comes both persist after section of the optic poeves, their appearance suggesting no degenerative change. The external limiting membrane forms a natural boundary between the rolls and cones and their subjacent granule cella-

Outer Plenjorm Layer.—In this layer the protoplasmic branchings from the peripheral ends of the bipolar cells take part—some interlacing with the termini of the centric branch of the some cell; others receiving between them the spherical globules of the centric branch of the rods. Hamifying fibres extend also into this layer from the horizontal cells of the subjacent stratum.



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SCHEME OF RETINAL LAYERS IN MAMMALS.



Juner Granule Layer .- Three subdivisions are described by Cajal-(a) horizontal cells ; (5) hipolar granules ; (c) retinal spengioblasis. The former consist of small said large herizontally disposed nerve cells, of which the large-sized are the most internal; both throw off trunerous peotopiasmic processes and a long axon | the axon from the amalier and more superficial cell is very fine, giving origin to several short ramifying collaterals. In the deeper cells this axon is much larger, and terminates, after a lengthened course, in a rich arbornation in connection with the spherules of the rods (Cajal). These ramifications add, therefore, very materially to the plexiform meshwork of the third layer. The tepolar cells of this layer are fusiform in contour, give off from their peripheral pole a tuft of protoplasmic branches, which spread laterally into the outer plexiform layer; whilst the fine centric branch descends to different levels of the inner pleniform layer, ending in a plume of free branches in close relationship to the ascending dendrites of the ganglionic cells. Cajal specially distinguishes these bipolar cells into such as lave a peripheral ascending plume of branches, and those with a fattened plume; the former being distributed to the spherules of the rods; the latter to the branches of the comes. The terminal arborisations of the centric or descending branch of these hipplar cells meet the dendrites of the ganglionic cells at different levels of the inner plexiform layer, thus dividing it into five or more strata.

Retinal Spangioblasts.—These cells are remarkable in the fact that they possess no axon. They are disposed in the lowermost stratum of the inner granule layer, in immediate contact with the inner plexiform layer and all their processes are directed centrally. Schafer doubts their acreess sature.*

fance Placiform Layer.—We have, therefore, immediately beneath the inner granule layer, a very rich relational field, in which three distinct retinal elements are brought into immediate apposition, viz.;—

(a) Bipolar granule elements; (b) Retinal spengioblasts; (c) Gauglianic cells.

This elaborate system of fibres is known as the inner plexiform layer.

Gonglionic Cells.—These cells, like those of other parts of the
nervous centres, vary much in size, from 15 a to 30 a in diameter in
the fresh state; they are flack-shaped or ovaid in contour, usually
devoid of pigment, and possess a large nucleus with a preminent
nucleolus. They give origin to a peripheral and centric process—the
former directed into the depths of the inner plexiform layer, as a
dendritic arborisation, extending laterally in the horizontal plane as
far as one or other of the five stratifications of this layer, where they

"The Nerve Cell considered as the Basic of Neurology," Bosis, 1993, p. 138.

bland with the corresponding terminal fibres of the retinal spengioblasts and the hipolar granule elements. The centric process is really its axon, which becomes continuous, as an optic nerve fibre, with the deepest layer as it courses towards the optic nerve.

Capal divides these ganglionic cells into three series; those whose dendrities are restricted to one stratification only; those distributed to two or more; and those which observe no such law of stratification, but are equally distributed throughout the whole depth of this plexiform layer ("cellules unistratifiles, multistratifiles, et diffuses"). So far, therefore, from the optic serve fibres being in direct continuity with the special visual elements of the retina-the rods and coneswe find, according to the researches of Cajal, Van Gebuchten, and others, that there are two breaks in this course; the first, betwint the dendrites of the ganglionic cells and the hipolar elements; the next, betwirt the peripheral offiboots of the latter and the termina of the centric branches of the rods and consu respectively. This is in accordwith the results of physiological and pathological teaching, for we know that section of the optic nerve fibres entails fatty degeneration of the ganglion cells of the retina (Krouse), whilst the rods and cones escape intact; moreover, in blindness from optic nerve stropby and in glaucoma from intraocular pressure the gauglion cells suffer in like manner.

The Cerebellar Cortex-Lamination.-The cerebellar cortex may he regarded as two laminated, a superficial or external, commonly termed "the molecular layer," and an internal or granife layer; whilst upon the confines of both is a series of voluntinous cells peculiar to the corebellar structure, termed the "cells of Purkinje." The leadets or foliols of the cerebellum are mostly disposed transversely to the undere-posterior axis of the brain, and sections may be taken either in the direction of the plane of these lamella-i.e., frontal sections, or serous their plane anters-posteriorly - i.e., sagrittal sections. The microscopic appearance is very different in these two cases. In the antero-posterior or asgittal section, the dendritie expansions of the cells of Purkings attain their maximum development and are displayed to the greatest advantage, whilst the nerve cells peculiar to the superficial layer, with their neurakous, are also seen following the same plane. In frontal sections, on the other hand, the cells of Purkinje are seen as it were in großie, their deadritie branchings, insignificant and dattened laterally, would indicate a somewhat fan shaped conformation in the direction of the nigittal plane. At the same time, we lose the characteristic branchings of the nerve cells peculiar to the molecular layer, and, in tien thereof, we see a horizontal striction of this layer, due to bifurcation of the group of the granule cells of the deeper layer, and which, being out across in









nagistal sections, appear simply as innumerable dots scattered throughout the field at this level.

Superficial Layer of Course. The external layer immediately beneath the pin has, in the embryo, a structure quite peculiar to itself, of which, however, all trace is lost in later life; it forms a peripheral zone (not as yet encounched agen by the dendrons of the cells of Parkinje) and consists, according to Calal, of—

- (1) A superficial series of granule-like cells placed vertically to the surface :
- (2) A deeper layer of horizontally disposed hipolar cells lying next to the molecular layer.

In the fully developed cortex, however, the elements demanding attention are —(a) The intrinsic nerve cells or elements peculiar to this layer; (b) the deadross and collaterals of the cells of Furkinje, together with the nerve fibres extending from underlying structures; (c) non-nervous or connective elements.

(a) Nerve Cells of the Superficial Layer. These are irregular, stellate, or polyhedral cells, most sumerous in the deeper realm of this layer, baying their long axis disposed antero-posteriorly-i.e., in the plane of the dendrous of the cells of Purkinja. Numerous long protoplasmic processes are given of by these celle; but, in particular, a fine and greatly elegrated axon, which also courses along the place of these same dendrons. Along this course, which is more or less parallel to the surface of the cortex, vertical offshoots or collaborals descend to the cells of Purkinje, and, becoming coarser near these cells, split up into a terminal ramification, which forms a basket-work " embracing the body of the latter as far as the commencement of its axon. Contracted over the lower pole of the cell, this basket-work extends brishlike a short distance along the neuroscon, where it is still devoid of a medallary sheath. It is remarkable how this terminal lunket-work energes staining in uniline preparations, where the cells of Purkinje are yet admirably displayed. The cell with enclosing backet work is named by Kolliker a "basket cell" (Koricellen).

Close to the pial surface of the coetex a few stellate cells, much smaller, are found; their proteplasmic processes are richly developed, and the axen, which runs satero postericely, ramifica extensively, but its destination is unknown.

(b) Cells of Packings.—These flask shaped cells, so characteristic of the cerebellar certex, throw off from their upper or outer pole a single or deable dendron (in the latter case, giving the cell a somewhat horned appearance), from which seises a luxuriant arberisation by frequent dichotomous division as far as the surface of the cortex. These dendrites neither anastonous with such other nor with the

^{*} Endiourhea, Fauritarie, Penrysami of Källikes,

neighbouring cells; they are strictly terminal and often turn back upon themselven. The dendritic system is special ant along the antero-posterior plane, and the branches are, successes, thickly studded with minute thermy processes like the corresponding projections (épines) upon nerve cells in other regions (Fas Gelandera, Cojal, Retrias). From the lower or internal pole of the cell descends the neuraxon, which, passing through the gesoule tayer of the cerebellum (becoming modulisted in this course), enters the central medialisted core of the lamina, probably passing out of the cerebellum to distant centres. Shortly after its origin the axon throws off some two or three delicate collaterals, which, passing upwards into the peripheral layer, and by a terminal ramification in contact with the lower dendrites of the neighbouring cells of Purkinje; thus, according to Cajal, they ensure a certain degree of functional solidarnty.

Bosides the structures just described the molecular layer displays in frantal sections (i.e., sections taken along the course of the homines a distinct striation due to fibres running at all depths parallel to the surface, which, on close examination, are seen to arise in all cases from the T-shaped bifurcation of numerous vertical fibres passing apwards into this layer from the stratum of granules below. These delicate fibres, which are really the axons of the granules of the cerebellum, giveof no collaterals, pass horizontally through the dendritic expansions of the cells of Purkinje, and thus bring the granule layer into intimate connection with those arborisations. They are stated by Cajal to end after a lengthened course in a free and various thickening your the white matter of the lamina. If we refer to frontal sections as the "plane of landuation," and to the sagittal sections across a lamina us the "plane of arborisation," i.e., of the dendrities of Purkmie, then it may be stated that the cells of Furkinje are brought into intimate functional relationship along the plane of arberisation by the axons of the cells of the peripheral layer, and the hasket-work resulting from their collaterals; whilst they are bound in functional relationship along the laminer plans by the parallel T-shaped axons arteing from the granules of the second layer; and at the same time their functional so-operation may be established by the recurrent collaterals arising from their axons, and ramifying in the proximity of the lower dendrites of the neighbouring cells of Parkinie.

A further relationship, however, is established between the cells of Purkinje and certain coarse fibres ("fibres grimpantes" of Cajal) which ascerd from the central medulis through the granule layer, and form a dense planus upon the primary and secondary dendrites of these cells, just as the nerve cells of the peripheral layer form the basketwork caveloping the body of the cell. The peripheral origin of these fibres is unknown. (c) Non-nercous or Connectics Elements. These are of two kinds -

(1) A large irregularly shaped dendritic cell, lying in close proximity to the cells of Parkinje, which throws off, in the granule layer, a number of thick abort procumes and several long vertical branches. The latter pass upwards into the peripheral layer, each fibre ending immediately beneath the pix in a small triangular or conical thickening; these fibres have long been known as the fibres of Bergmann.

(2) Deeper in the granule layer and extending into the modullated centres are numerous stellate cells in no wise differing from the

stellate glia cells common to the nervous centres at large.

Granule Layer of the Cortox.—Beneath the peripheral layer is a compact stratum of small, nearly spherical nerve cells, possessing very little protoplasm, and throwing off an all sides some few about processes, which end in miniature arberisations around the bodies of the neighbouring granules. From the cell body or one of its processes arises an extremely delicate axon, which passes vertically upwards, and, at varying levels in the outer zone, bifurcates into the T-shaped fibres which have already been aligned to in this stratum of the cortex.

Golgi and Cajai also describe large stellate cells as occurring sparsely in the granule layer, with extensive protoplasmic processes spreading in all directions—often far into the peripheral layer, and with an axon which, passing slownwards into the granule layer, ramifies to an extraordinary extent assenget these granules, ending, according to Caial, by free various extremities.

Non Fibres of the Corebellum.—In the granule layer certain notable fibres, first described by Cajai as most fibres, appear; they ascend from the medulla as coarse medullated fibres which, on entering the granule layer, split up and samily extensively among the granules, presenting here and there along their course peculiar rough knocty thickenings or most-like growth, and do not extend beyond the granule layer. These fibres are presumed to bring the granules of the corebellum into relationship with distant nerve centres, and are suggested as the possible central nerve termini of the cerebellae tract (Cojet)

Our review of the foregoing types of cortical lamination in the mammalian brain prepares the way for certain deductions which have an important bearing upon the physiology and pathology of the corebrain. In the first place, let us note that the simpler forms of cortex are confined to the lower margin of the certical envelope, where it folds round the cerebral pedunds at the base—the cornu Ammonis, the lower limbic lobe ("outer olfactory type"), and also the olfactory area of Gratiolet.

The more complex form of cortex, however, spreads over the upper limbic arc and the whole of the extra limbic region of

the hemisphere. It is these more complex forms of cortex which concern us chiefly; they comprise in man the extensive areas at the vertex and the whole convoluted surface of the hemispheres, as seen from above. Now, in studying the small brain of the redent and higher animals, we find structural modifications in the cortex of this region, which appear to foreshadow the divergences observed in man. Thus, if we examine successively the cortex at different points from within outwards in a vertical section through the hemisphere, passing through the Sylvian depression, we find that—

- (a) The first layer of the cortex is deepest at the asgittal border, and steadily diminishes in depth as we proceed outwards towards the limbic flowers;
- (b) The second layer of small pyramidal cells increases rapidly in depth and in smallh of cell-structure in a reverse direction—i.e., from within outwards;
- (c) The gaughtonic series of cells (which assume thick clustered nests in the upper limbic are and over the vertex bordering on the sagistal flavore), gradually loses its confluent tendency and becomes spread out in isolated units ("solitary type") as we approach the limbic figure externally. On the other hand, if we examine similarly a vertical section taken through the posterior moiety of the upper limbic are (Plate vs.) we find that—
- (d) The intercalated series of granule cells increases in richness of elements and depth of formation as we proceed outwards to the lateral aspects of the hemispheres, and hashwards to the occipital pole; and reaching the limbic floure terminates alsouptly, whilst the other layers pass on uninterruptedly. If we now examine vertical sections of the hemisphere in the anters-posterior plane, we find that—
- (e) The outer layer (peripheral zone) progressively diminishes in depth from the frontal to the occipital pole;
- (f) The small pyramidal cells of the second layer diminish in size in the same direction;
- (y) The granule or angular cells intervalated in the five-laminated cortex increase in richness complexously towards the occipital pole;
- (6) Lastly, the ganglionic series, which near the frontal pole forms a deep layer rich in cell elements, thins out considerably backwards into a laminar or "solitary" formation; but, at the extreme occipital pole, these cells again form a somewhat deep belt with granule cells superimposed.

The obvious deductions to be made from the foregoing are that certain elements preponderate in certain fixed areas of the cortex, and that the development of certain layers opposes to exclude that of another series. Thus the frontal pole and frontal extremity of the upper limbic are are especially characterised by the preponderance of the ganglionic series, which accumulates here in rich clustered groups; towards the Sylvide border this element is insignificant, and it is the small pyramidal layer which here prevails. Towards the occipital pole menially ("medified upper limbic type") the granule cell attains like importance from its notable wealth of elements and its more or less complete exclusion of the small pyramidal series; whilst outside this formation, in the extra limbic cortex, the intereslated granule belt is a notable feature, accompanying a corresponding impoverishment of the small pyramidal and ganglionic series.

A certain relationship also would seem to exist between the depth of the first layer or peripheral zone and the ganglionic series of cells; since it notably diminishes in depth as these elements thin out into the solitary type of arrangement, and this despite the marked increase in the small pyranodal series above. This mutual dependence seems to us explained by the fact that the spical processes of these large elements pass up into, and terminate in, this peripheral sene, so that any regional difference in the depth of the outer layer will be dependent on the greater or less development of these ganglionic cells. It must be forme in mind, however, that the merage depth of the first layer increases in lower mammals and becomes shallower as we else to the more highly organised brains-a fact which does not militate, as might at first appear, against the preceding conclusion. In the lower mammals, the absolute and relative increase in the depth of this outer layer probably means a large preponderance of the connective over the nervous element.*

Regional Distribution of the Ganglionic Cell.—Attention was first directed to the peculiarly clustered arrangement of these cells in the cortex of man and the higher ages by Professor Betz, i who denominated them "giant pyramids," and suggested their probable sister signification from their form, arrangement, and connections, Subsequent research appears fully to confirm the conclusion arrived at by Betz, I and it becomes, therefore, important to indicate the regional distribution of these elements. We find that this series of cells in man

^{*} See upon this point, Meymert, "Brain of Massenatis," Spd. Sec., p. 283; also, Resis, ed. i., p. 258.

^{* &}quot;Anatomischer Nachereis zweier Gehirnsentra," Prof. Bent, Contrabber f. d. Med. Wiesmark., Aug., 1884.

It is true that Meynert would dispose of the assumed significance of these cells on the ground that their large size depends on the distance which their spical process has to traverse in reaching the outer layer, and their gradual increase in directions being, as he states, proportionate to this distance. The "gradual increase is size" alliabed to process to us that Mayourt has failed to identify the elements referred to—probably intetaking for them the larger pyramids; and finally his argument falls to the ground when it is seen that the around layer of the "modified lower lands: type" contains larger elements than any of its subjected layers.

and the higher mammals (Pig. Sheep, Dog. Cat, Ape, and Man) assumes in separate regions of the cortex a different arrangement, which we have termed the clustered or nested and the laminar or solitary arrangement "-the former showing these large cells aggregated into distinct avail electors stationed at intervals apart—the latter approaching the arrangement of these cells universally met with at the base of a sulcus, viz.; -- solitary cells, stationed like sentinels wide apart, showing no tendeury to grouping beyond two or three at most in certain exceptional areas. In lower seasonals (Rabbit and Rat), these discrete or distant clusters do not appear; but what we take to be the homologue of this series forces confluent groups—the nested arrangement being carnely indicated, and a deep and dense formation replacing the latter. As already observed, however, those configent groups thin out, in certain regions, into linear file, assuming the laminar or solitary arrangement. The cells of this series in these lowly-organised brains are possible in their extremely elongate peramidal or fusiform contour, and approach in this respect the form of the larger pyramids in the busish cortex rather than the configuration of the motor cell. As we pass from the confluent groups of elongated elements in the Rodent to the more specialised areas of higher maximals, we find that-

- (1) The rells become less alongate, more swollen, and irregular in contour;
 - (2) Their groupings become more and more discrete;
 - (5) The individual groups grow larger in site;
 - (4) The electored arrangement occupies a wider range of cortex.

In Place 1 and v, this series of cells is richly represented; they are densely congregated towards the margin of the homisphere, and thence, continued to the limbic fissure, occupy the whole area embraced by Nos. 7 and 9 in Ferrier's work? Further back, however, this layer diminishes in depth and in wealth of cells, except at the exposed margin of the hemisphere, where it still remains a rich formation; beyond the margin and over the extra-limbic region, as far as the limbic finure, the cells rapidly thin out into a simple linear series, and the five-laminated cortex appears. Still further back the series, in like insurer, thins out into a mere insignificant formation—yet always most richly developed along the nagittal margin of the hemisphere.

Plate v., fig. 1, represents the arrangement of the ganglionic series in the pig, the regional distribution of which is almost identical in formation with that of the sheep. For both these animals, it may be stated that a free-invisated certex, with clustered only owners, aprends over the anterior half of the upper limbic are (which

^{**}Comparative Structure of Curtex Corden,* Trans. Rey. Soc., part 1., 1880.
Functions of the Brain, second chities, p. 256, fig. 28.

in these animals becomes superficial on the upper aspect of the bentsphere) over the frontal pole and along the first (or Sylvian) and second parietal convolution. Between these tracts is embraced the area of the third and fearth parietal convolutions, which have a six-faminated certex and a distinctly solitary arrangement of these cells.

If we examine the regional distribution in the cat, the anterior portion of the upper limble are in front of and above the crucial sulcas; the frontal lobe; the first parietal, or Sylvian; and the anterior extremity of the fourth parietal or sagittal convolution, will all be found to exhibit the laminated cortex and mated cells; yet the formation, excessively rich in the sigmoid gyri around the crucial sulcas, becomes much poorer in other regions. The six-laminated type extends over the whole extent of the upper limbic are, behind the crucial sulcas, as far back as the retro-limbic annoctant.

The distribution of these nested groups of ganglionic cells in the scelot, reproduces, in fact, very nearly the arrangement met with in the cat.

The distribution of the same formation in the Barbary ape foreshadows the arrangement which pertains to the more highly-developed cortex of man.

It will be observed from the foregoing remarks that the gracial sulcus in all these animals forms a distinct limit to two types of lamination—peculiar to the vertex—the five-and the six-laminated types, and that this distinction is continued upon the mental aspect of the hemisphere into which this sulcus extends; that, similarly, at the frontal pole of the hemisphere, the vertical sulcus, regarded by Brock as the representative of the fissure of Relando, also separates an inner or five-laminated from an outer or six-laminated cortex; whilst the first parietal or Sylvian convolution in the pig and sheep partnkes, in front of the Sylvian fissure, of the five-laminated type.

In 1882,* after a minute enquiry into the cortical suvelope of the brain in mammals, the author had reason to express himself as follows:

— The stare fully I investigate the minute structure of the cortex and its deep connections, the more forcibly am I impressed with the belief that the various fisures and sulm are not more accidental productions, that have a deep significance of their own, dividing off the contical experience into morphologically, if not physiologically, distinct organs, Hitherto the fisures and sulm which I have found to be boundary lines of distinct cortical realiss are the following:—

^{*} Dy. col., p. 724.

[#] That is, the result of pressure merely during the development of the crucial arch.

- "(1) The limbic fiscare.
- (4) The superior parietal sulcus.
- (2) The infra-parietal sulcus.
- (5) The interparietal soleus.
- (3) The crucial sulcus.
- (6) The offsittery sulcus.
- (7) The fivery of Relando."

Contrasts between the Brain of Man and of Lower Maremals,—When we contrast the cortex of the human brain and of the ape with that of the mammalian series below these types, certain strongly-marked resemblances in intimate structure, as well as equally notable divergences, present themselves. With respect first to the resemblances, it is to be noted that the various types of certical lamination described in the lower mammals are reproduced in the brain of the ape and man; and that the several layers maintain the same relative position throughout their depth, except where in certain cases a layer is wanting, or a new layer is interposed. Again, the individual elements constituting these layers—the granule cell, the angular cell, the spindle, the pyramidal element—although differing sensewhat in dimensions and general contour, are yet sufficiently alike for their identification apart from their mere position in the certex.

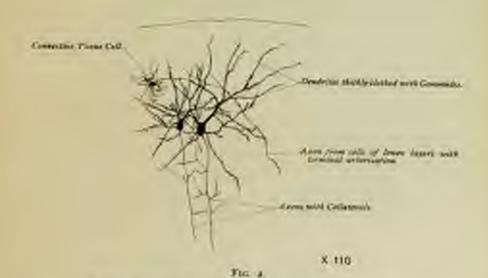
In the next place, the lower limble margin of the cortical envelope always presents the simpler forms of cortex; while, towards the vertex and metally both towards frontal and occipital poles, the more complex forms of cortex prexail. Another striking resemblance occurs in the distribution of these laminar types—that characterised by the granule cell predominating towards the occipital pole; that of the fivelaminated type being especially developed towards the frontal pole; with this there is associated finally the gradual dimination in size of the one element towards the temporal and accipital lobe, and the increased dimensions and richness of formation of the other element in the same direction. These are some of the more striking resemblances presented between the cortex cerebri of man and that of the lawer manuals.

As to the divergences presented by these structures, we are early struck by the fact that the abruptness of transition from one to another type of cortex, seen, e.g., in the rodent, is not a feature in the human brain; in fact, transition-realms invariably intervene betwint different types of lamination. The one fades into the other form so gradually that a line of demarcation can carely be drawn. Thus, the five-laminated cortex characterizing the "motor area" of the human brain affords no abropt transition into the six laminated cortex lying external and posterior to it; a mixed type intervenes, to which we have applied the term of "transition-realm."

In the second place, the cells which we have ventured to term "motor" in the fourth layer of the human certex, differ from what we



Fig. 1.



BRAIN OF YOUNG RAT: SECOND LAYER OF CORTEX NERVECELLS, SHOWING EXTREMELY HIRSUTE DENDRITES AND DESCENDING AXONS



have regarded as the homologous series in lower masseals, in being restricted as a typical formation to a comparatively limited area of the costex—that of the rodent, e.g., being spread over a far wider proportionate area of the hemisphere. This concentration of these colligroups is best seen in carninors, where, as already shown, they crowd around the crucial soleus, especially at the angle of the segmoid gyrus. They exhibit the bendency in a less marked degree in the higher apea, whilst in man they are concentrated in three or four districts occupying, as before stated, but a comparatively limited area. A still more notable distinction between the higher and lower forms of brain presented by this formation, is the nested arrangement observed by Botz in the human brain. This segregation is complete, the groups being large and far apart. As we descend the scale, however, the more do we observe the tendency for such groups to become confluent, and the series to be disposed as an equable stratum.

Lamination of the Motor Area in Man .- That region of the cortes which has been shown in animals to be electrically excitable, and which upon atimulation calls forth responsive movements, has been termed the "motor area." It is, as we have just seen, characterited by a highly specialised structural arrangement. It is all the more essential that its structure in man should be clearly defined. here, since it has been the subject of dispute between such writers as Moynert, Bets, Balllarger, Mierzejewski, and others, some authorities speaking of it as a five-laminated and others as a six-laminated type. At the outset, therefore, it is well to define our own view of the case, which is briefly as follows:- The cartex typical of motor areas is a five-laminated formation, and the more absolutely the granulecell formation (which, when intercalated, gives us the six-laminated type) is excluded, the more highly specialised become those groups of enormous nerve cells which go by the name of the "nests" of Betz. Where, therefore, these cell-clusters are best represented, there we find a five-laminated, not a six-laminated, cortex; in other words, at those sites the granule-cell layer to longer exists. Such a specialised cortex is not spread uniformly over a large convolutionary surface at the vertex-any such notion would be very for from correct; but it occupies very irregular, limited, and unequal areas along the course of the ascending frontal and the junctions between it and the frontal geri, as well as the "paracentral lobule." These positions we shall more clearly define later on.

Such irregularly-thisposed areas are severed from such other by a transitional form of lamination, whereby those districts gradually merge into the six-laminated certex surrounding them. This highly-specialised certical formation is constituted as follows:—

pirst Layer. An extremely delicate pale zone limits the cortex

externally; it presents all the features already described as peculiar to the cortical neuroglis (see p. 94). The outer surface, upon which the intima pix rests, presents numerous flattened cells, from which excessively delicate processes pass downwards into this layer. These cellular elements are often found, detached from fresh sections, floating in the medium around; they form, in fact, a kind of spithelial limiting layer, extremely delicate and translucent. This first layer, or peripheral cone, exhibits a pellucid homogeneous matrix (becoming finely melocular with reagents) and three structural constituents—(a) non-nervous, (b) nervous, (c) vascular.

(e) The con-servous constituents are not numerous, are widely shapersed, and belong to the two categories of the perivacular or adventitial elements and the elements of the lymph-connective system already referred to (p. 94). The former measure 6 a to 9 a in diameter, possess a spheroidal nucleus, stain well, and are seen disposed along the course of the blood-vessels. The latter often measure 13 a in diameter, possess one and occasionally two or three nuclei, are spheroidal, flask-shaped, or irregular in contour, stain uniformly and very faintly, and throw off numerous excessively delicate processes, which in healthy fresh certex can only be distinguished with difficulty.

(6) The aereous considerate embrace a series of modellated, nonmedullated nerve fibres, and nerve cells peculiar to this layer:

The medulisted nerve fibres course along the outer division of this accoular layer, in a horizontal direction, lying parallel to the piol surface of the cortex; many of these are observed to pass downwards into the deeper layers of the grey matter. In certain regions, this medulisted tract or tangential belt, so characteristic of the first cortical layer, lies at a semewhat deeper level near the second layer of cells. In most small enamuals these fibres take also an antero-posterior direction. The non-medulisted nerve fibres are of two kinds, viz., protoplasmic processes or deadrons from the underlying cells (p. 128); and terminal distribution of axons from the cells peculiar to this layer, and also from those of subjacent tracts.

The name cells, very sparse in number, are chiefly limited to the lower two-thirds of the peripheral zone. Three kinds of nerve cells are described by Cajal —the polygonal or stellate, with numerous protoplasmic processes, but with one axon only, which, arising from the tody of the cell, ramides very extensively in all directions in this zone, terminating in fine, variouse and free fibrils, long fusiform, hipolar cells disposed autoro-postericely, and, from either pole, giving origin to an exceedingly long protoplasmic process, which along its course throws of from time to time collateral branches upwards to the pial surface. The poculiar feature, however, in these cells is the planning of their axons; each main protoplasmic branch appears con-

timeous with, or gives off at some distance from the cell, an exenwhich, coursing horizontally, throws off numerous ascending collisterals, ending in extremely delicate branches throughout a very extensive region of this layer. Such axons are probably medallated (Cojal). Supernumerary axons arise also from the secondary protoplasmic branches, usually ascending in their course. These cells, therefore, exhibit the unusual feature of protoplasmic processes ending in axons.

Lastly, there are triangular elements which usually throw off these main pretoplasmic processes; two of which run horizontally to the surface, or course accessing obliquely upwards; whilst the third passes downwards to infurents into arguste processes, from which arise two, three, or more axons probably meduliated, and of extensive distribution. A smaller and more rounded element is also found here, which not only originates axons from its protoplasmic processes, but sends off an axon from the cell body, from which numerous cellaterals arise and ascend to the surface.

In all these nerve cells of the peripheral zone, besides the plurality

of axons, their extensive ramification, and their origin from protoplasmic processes, the characteristic features are the great paucity of dendritic branchings, the great length of the dendross, and the absence of varicosities and collateral spines (Cajal).

(c) The viscular elements pass as long straight vessels for sleep distribution, and as short branched and smaller vessels through its structure; they call for no special remark here.

Second Layer. —A narrow helt of very closely aggregated nerve cells of irregular marginal centour, aval, pyramidal, or angular, with a proportionately large nucleus, forms this stratum. The cells vary much in sire, and, as we have previously re-

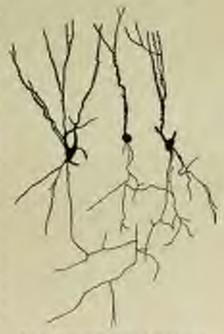


Fig. 15.—Cerebral cortex: norse relical around layer: descending access.

marked, are much more richly developed in some than in other regions of the brain. They measure (6g. 15) from 11 a to 23 a in length, 6 a to 3 a in brendth, the nucleus being often 6 a in diameter. They exhibit numerous delicate processes, radiating from the base and sides; but a distinct apical process or frequently a bi-corned apex passes up radially to the surface of the cortex and undergoes rapid subdivision. In the cortex at the vertex is a rat and rabbit this second layer is practically absent; although it may be traced as small, scattered, approssed groupings of cells on the lateral aspects of the brain. To see these cells to advantage in such brains we must examine the lower arc of the limbic labe. The same may be said for the sheep; but, in the pag, this layer is a fairly notable one throughout, reaching a thickness of 138 μ. In the cut, dog, and must the depth attained may be 279 μ.

Third Layer.—Subjacent to the above lies a deep belt of nerve cells, the elements of which are characterised by their more or less elongated or pyramicial contour, and by the tendency to gradual increase in their size as they lie deeper in the cortex. The summit of these cells is elongated into a long delicate apex powers, which passes radially upwards towards the peripheral zone. The opposite pole of the cell is irregularly elemented by the extension of numerous delicate processes, which are thrown of from the cell in all directions around: none of these processes turn upwards and pursue the course of the spex process. The dimensions of these cells in the outerword zone average $12 \mu \times 3 \mu$; those of the deeper regions of this layer 22μ up to even 41μ in length, and 23μ in shorter diameter. Each cell possesses a large nucleus and a distinct nucleolus. Small pyramidal cells, however, no larger than those at the commencement of this layer, occur even at the deepest part, side by side with the largest.

Fourth Layer.—This layer presents us with the highly characteristic nerve element which we have already dealt with under the name of "motor ceil." These great elements are found modified in different cortical realms as follows:—

- (a) In the highest regions of the motor area (summit of central gyri and paracentral tolonic) they are not only of gigantic size, as compared with other nerve cells around, but they form here the large clusters seeognised by Betz.
- (6) In the lossed regions of the motor area (lower end of central and junction with third frontal gyrus) they become small in size, even less than the superjacent elements of the third layer, but still setain their elements disposition.
- (c) Towards every suicus these cells, be they large or small, lese their groupings, and at the base of the suicus they always assume the drawn out single file, spoken of as the "solitary" type of arrangement.
- (d) Lastly, as this lammar type passes into that of the sensory realms, these cells have superimposed on them a layer of granule cells, but still retain a consentat clustered disposition so characterising

the transitional cortex; and they ultimately assume the solitary arrangement always seen in a sulcus, riscondicus the correlation at all heights, becoming, in fact, the six-laminated sortex typical of sensory areas. Such are the modifications undergone by these elements at different localities in the cortex.

Fifth Layer.—This layer is represented by the series of spindle cells, which, beneath the summit of a convolution, are disposed sadially to the surface in regular columns, separated by bundles of medullated fasciculi, ascending from the central medullated core of the gyrus. Towards a sulcus they lose this radial disposition, and at the bettem of the sulcus are disposed in a narrow belt, their long axes horizontal to the surface, a position aptly termed reclimate by Dr. Major. These cells measure from 25 as to 32 a in length, by 9 a to 13 a in breadth, and exhibit a large oval nucleus.

Distribution of the Motor-cell Groups.-The specialised five-

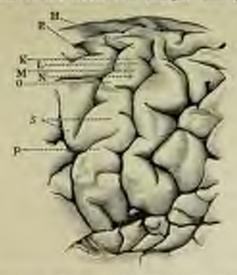


Fig. 36 - Left assembling frontal and parietal convolutions seen from the side, with the attached frontal gyre included in scheme of examination

H. K. Third group of gauginesis sells. N.O. Fourth group of gauginesis cells.
M.N. Barren area. R. Region of large clougate cells.
F. Pitti group of gauginesis cells.

laminated cortex, with the cell clusters above referred to, has been stated to occupy certain areas of the ascending frental, the three frontal gyri and the "paracentral" lobule; it remains for us to indicate more particularly the exact size occupied by this type. In the scheme now presented, the results of an investigation into the localisation of these areas in eight human beains, made in 1878 by the author in conjunction

with Dr. Henry Clark, are given.* The arrangement and distribution were strangely uniform in all these cases (see figs. 16 and 17). Variations in the extent of these areas, of course, presented themselves, but not to such an extent as to vitiate the general result arrived at, via, that such cell-clusters were grouped into several distinct areas, very clearly and definitely interrupted by the transitional type of cortex. The variations in the extent of such areas are no more than night be anticipated from the developmental variations indicated by the form of the central and neighbouring gyri. The upper end of the according frontal and its junction with the upper frontal gyrus are, as is well known, very variable in form and complexity, and such variations are, in our opinion, closely related to the more or less rich development of the specialised cortex under consideration. Reference to the scheme shows us that the ascending frontal gyrus may, in general, for convenionce of description be considered as consisting of two segmentsan upper, comprising two-thirds its length, into which run the superior and middle frontal; and a lower, comprising the remaining third, continuous with the inferior frontal in front, and with the ascending parietal behind,

Taking frat the upper two thirds, we find that the upper and has



Fig. 17.—Left according frontal and purisful gyrs, with the attached frontal convolutions, as seen at the vertex.

A-D. Viest group of ganglionic nells.

M-N, Barren area.

E-G, Roosed

N-O. Fearth group of sauglionic rella-

H-K, Third R. Region of large elongate cells.

a conservant broad attachment to the upper frontal. The lower end
receives the middle frontal usually as a nerrower folded convolution.

receives the middle frontal usually as a narrower totaled convolution, whilst between either junction a sinusus knee-like bend of the convolution exists. The broad upper extremity continuous with the upper frontal is the site of two important clustered groups (A-D and E-G); the plump lobule intervening between both upper frontals is the site

* - The Certical Lamination of the Motor Area of the Besin," by Bevan Lawis and Berry Clarke, Proc. Roy. Soc., No. 185, 1878.

of two other similar groups (H-K); lastly, the extrems posterior end of the middle frontal gyrus shows similar cell groupings (N-O), the areas of which extend into those of the ascending frontal at their lines of attachment.

The upper group (A-D) presents by far the larger cells and the more perfect and dense clusters. Such clusters occupy especially the perietal aspect of the convolution, which is adjacent to the ascending perietal convolution. They appear, therefore, in the cortex forming the wall of the Rolandic fiscure, and creep up towards the summit, where they rapidly thin out and disappear.

The second young (E.-G), connected with the lower attachment of the apper frontal, is entirely restricted to the frontal sepect of this gyrus, and does not overleap the confines of the vertex and agreed into the Eclandic desure, except at its most inferior part.

The third prosp (H-K) forms a large area, covering the parietal or Relandic wall of its knee-like labule (apper two-thirds), and apreads over the summit of the convolution at this site. Between it and the fourth group occurs a narrow territory wholly devoid of this formation; transitional certex extending until we reach the latter group.

At the junction of the middle frontal (N=O).—This group, as before stated, becomes continuous with that of the middle frontal; it also begins with the feature of Relando and sweeps over the vertex.

The folk and sixth groups (P) are indicated approximately on the achieve, but appear subject to considerable variations in extent.

To the foregoing groups must be added a further area, occupying the penterior two-thirds of the labule on the inner or menial aspect of the central gyri, lying in front of the finance of Rolando and above the gyrus fermionan, unusily termed the paraceutral lobule. Some encormous cells are found in the groupings of this area.

Transition-Realms of Motor Cortex.—It will be observed that, in the above enumeration of specialised areas, we have by no means covered the ground assigned to the motor area by Prof. Ferrier: the lower end of the ascending frontal, the whole of the ascending parietal, as well as the postero-parietal lobule have been omitted. In fact, these latter regions do not exhibit the specialised cortex referred to, but are covered by cortex transitional in its character between the former and what we find existing in sensory realms. If, for instance, the upper extremity of the ascending parietal be subjected to examination, we find that its interior aspect, dipping down into the Rolandic finure, also possesses large gauglionis cells similar to those in the motor area in advance of this site. The nests or clusters, however, are not only thinly scattered, but contain few cells, and the inter-domach rapidly in size at lower levels along this convolution; it is only at the upper extremity of the gyrus that large cells are found.

Throughout by far the greater extent of this convolution, the cells of this layer are exact representatives of those found in the according frontal, but are greatly dissinished in size, and although often arranged in clustered groups, the groups are poor in elements and spaces.

The major distinction between the transitional and specialized motor cortex is in the presence of a gradually increasing belt of small pyramidal or angular cells, which are almost identical with these of the second layer, and which here insinuate themselves between the largest cells of the third layer and the sparse nests of the ganglionic cells. Thus, with the fading-off of this rich clustered formation, we get the interculation of an entirely new layer of elements, which grows in importance as we approach sensory realms. Now the whole ascending parietal, postero-parietal, and lower end of the ascending frontal divisions, partake of this aix-laminated type of cortex; and; moreover, as we approach the margin of the brain-mantle-i.e., the lower end of the central gyri-the "motor" cells become smaller and yet smaller, forming eventually insignificant clusters of minute elements. Roughly stating the case, we may say that the figure of Rolando in the upper two-thirds of its extent, separates the typical motor cortex from the transitional cortex; whilst, in like manner, the interparietal fissureis the boundary between the transitional and the typical sensory cortex. below and posterior to it.

It will be apparent from the foregoing chapter on the histological structure of the cortex cerebri that its many varieties of type depend, for the most part, upon the operation of one or more of the following circumstances. There may be—

- (1) Inverse development of superimposed layers—such, for instance, as was noted in the redent's brain, where the third layer of cells invariably because shallower with increasing richness of the second layer of angular elements and vice terms. As the one fermation tends to die set, the other tends to increase in thickness and density.
- (2) Substitutional stratification may occur—i.e., a layer of cells may have other elements mixed with it, and gradually proporderating to the excinsion of its own cells, and then a charge in type may occur, i.g., the granule cells may gradually intermingle with the angular elements, and excluding them entirely, form a deep belt in their place, or vice serse.
- (3) Intercalation of new layers, as in the appearance of a sixlaminated type, where the augular elements gradually insinuatethemselves between the third layer of pyramidal cells and the subjacent ganglionic series. Or, again, an altered type of cortex may proceed from—
- (4) An unusual development of this elements of a certain layer, as when the angular element of the second layer develops into the large





glabose cell of this layer in the modified lower limbic type of the rat, rabbit, male, &c.; or where the elements of the lifth layer in the sensory cortex become changed into the larger complex cells of the motor groupings. As we traverse the whole range of the certex, one to other of the above influences is at work in medifying its form of stratification.

Passing now from the question of certical lamination to the cell itself, its conditions of life and functional activity, and its relationshipto its immediate environment, let us first sak surselves what signifinance, if any, is presented by the great variations in size of the different nerve cells; is it but an accident of their position in the cortex as to relative depth; is it indicative merely of the age of the cell is it dependent on their specific functional connections; or upon the degree of complexity attained by the nerve element ! Is it a mee-"accident" of their position? This has been assumed by Meynert upon premises which cannot for one moment be admitted. In an article published some twenty years since," Meynert summarily dismisses the observations of Betz on the "giant cells" of the anterior central convolution ("ascending frontal") as of no importance, because the explanation of their huge size is solely due, according to Professor Meyners, to the greater slepth of the cortex of this convolution; the ance processes of these cells, therefore, having to traverse a greater distance in their low-lying groups ere they reach the outer layer of the cortex. Their groupings, also, he explains as a mere pressing together of the cells by the bundles of nerve fibres passing apwards from the medulla of the gyrus. It is obviously natural to suppose that the greater the distance along which a nerve cell has to transmit its curry, the larger will that nerve cell probably be; in the next place, as we are dealing with the accommodulated fibre of the apex, we might also assume that the loss by diffusion around may also demand a comparatively stronger discharge in such a case, shill horse a proportionately larger cells all this is, of course, in accordance with Meyuret's assumption, if we regard the deadrites as functionating celluli/agally; but, the reverse is now accepted as the true course puraned by the nerve corrent. Moreover, that the pyramidal cells steadily increase in dimensions with their depth is also in favour of his position, some it immerially true; but this is not the case. It has been shown in our examination of the brain-cortex in man and in manuscula, that alongside the largest pyramidal cells are numbers of others of the sunVest dimensions, which, according to Meyaert's view, should be much larger than the experimposed elements. Even in the woodcut illustrative of the five-laminated cortex given in Mornerc's

^{*} Psychiatriecke Centrellier, No. 8, 1878.

original memoir," we find numerous exceptions to his rule, that the smaller element is always higher in the correx, and, given a section of brain examined by the fresh methods, such exceptions become very numerous indeed. That the grown? treatmay to this larger size with their deeper position is maintained, we of course allow; what we dispute is the explanation afforded, which leaves out of consideration the numerous exceptional small elements referred to.

In the next place, were this explanation held tenable for this form of cortex, the formation described by us as the modified lower limbic cortex of the redent would entirely confute such a principle, since here we have a series of very large cells, the largest by far in the whole depth, here lying quite superficial as the second layer in the cortex.

What then is the more probable explanation of this increase in size of the cell! If we carefully note a section of fresh brain, we find that although the majority of the pyramidal cells steadily enlarge at greater depths-the ganglionic cell-clusters, but a very short remove from the largest pyramidal cells, represent an enormous leap in dimensions. Plates i. and v. represent conclusively what we have here stated: the outlines of the cells are represented at their respective levels as sketched by the camera lucids, and it is seen that the upper elements measure but 18 a × 11 a, being quite superficial in the series of small permaids; that the lowest of the series include elements recogning but 36 a x 23 a, although at a depth of 116 a. beneath the former whilst a little higher we find numerous cells measuring 18 a x 13 u in size—i.e., very slightly larger than these of the superficial series, although 958 a beneath them. When, however, we pass from the largest pyramidal to the ganglionic cells lying only 200 a lower down, we come suddenly upon huge elements measuring from 84 a to 97 a in length, by 36 a to 46 a in breadth. The increase in dimensions, therefore, is so sudden as to be out of all proportion to the greater depth of this layer. Is there, then, no constant relation between the size of the cell and other conditions to which it is exposed, which may give us the required explanation !

This we believe to be the case; we find as a constant accompanioners of increasing bulk, much more complex relationships with surrounding call districts—in other words, the larger the coll, the preser the unader of its branches. But the older the nerve cell, the longer time has it had for the establishment of organised relationships around; and beare it follows that the older cell is also the forger element. In fact, it appears to us that the size of the nerve cell is chiefly dependent upon its nge and the nultiplicity of its surrounding connections. There is, however, another factor which must be allowed much weight

in the case of the motor cortex. The seedullated fibre (axon), which arises from the basal extremity of the great motor cells, traverson uninterruptedly an engrancus distance to reach the respective cell-groups which represent in the spinal cord the nunculature of the limbs. The distance traversed is very unequal between the lumber and cervical groups; the certical centres representing the lower extremities having not only a greater distance through which to discharge their energy, but a far more massive musculature to call into activity, than is the case with the arm-centres of the cortea. Again, the cortical control for the upper extremities not only act through a greater range, but they innervate larger groups of muscles than do the centres for the head and neck, the muscles of articulation, deglatition, &c. It would, therefore, be natural to presume that the cortical cell-groups representing these respective regions would differ comiderably in the size of their individual elements. The histology of the motor area fully warrants us in stating this to be the case; the smallest cells being found at the lower end of the central gyri and Broce's convolution-and thence increasing rapidly in size upwards towards the centre for the great nunculature of the limbs, as illustrated by the following table of actual measurements ;-

Containance Size of Heats Critic.

	GARGING CHIES.	MATIREW SHE
Left according trouts (apper end),	95 = - 25 p	50 a × 45 a
Frontal gyrt forest at posterior endi.	45 x = 20 x	10 A × 27 A
Left according frontal (force ent);	35 p × 17 p	11 a = 18 a
Left assembling parietal (upper end), .	66 a × 41 a	35 x = 41 x
(middle third).	45 a × 37 a	35 a × 32 a
is in Clower Hirdly.	41 21	

We find this law fully beene out by the results of an examination of the bullow and spinal cell-groups in different regions—the greater musculature being presided over by the groups of largest cells. We, therefore, one reason for regarding the dimensions of these cells in the cortex as influenced by—

- (1) Range of discharging distance.
- (2) Size of musculature innervated. (3) Age of nerve cell.
 (4) Resulting multiplicity of cell connections.

It will be seen from these conclusions that the deepest elements are not necessarily the oldest, for some of the lowest of a series are very small and very simple in their connections. The reason for this was shrewdly given by De. Hors from observations on the develop-

ment of the motor cell-groups in the anterior comm of the spinal cord." His statement is to the effect that the younger cells are in closs centiguity to the blood vessels ; that as growth proceeds, they are thrust further aside, so that the larger and older cells he midway between parallel vessels. No one familiar with the structure and disposition of the cortical elements of the brain will fail to see the force of this augrention. These small pyramidal elements which we neet with constantly side by side with the older cells, are found often with very few lateral branchings, and the apex-process thins out rapidly and is lost to view at a short distance from the cell, notably contrasting in this respect with the older elements, whose apex-process can be traced up into the first layer or peripheral zone. It is important to sole this fact -new elements are being continually formed, which for some time have no connection with the grey menhanowh of the outer some of the cortex. These extensions from the upex or contrio pule of these young cells continue to thrust themselves further outwards, and are brought into apposition by delicate lateral offshoots, with acree-fibre pleasures around.

Can we suggest the significance borne by the nucleus in the autonomy of the nerve cell! The results of physiological experimenration by Ferrier, Hitzig, Horsley, and Ecovor, and clinical investigations, especially those of Hughlings-Jackson, appear conclusively to indicate the anterior or fronto-parietal realms of the cerebrum as especially motor; and the occipital and tempero-spheneidal labor as especially sensory, in their endowments; and it is, to say the least, highly suggestive that the large syramidal and ganglionic cells perellarly characterise the former, just us the smaller elements and densely aggregated granule cells characterise the latter-that, in fact, as we pass from motor to sensory realms, so we find the ageve cells progressively diminishing in bulk and the granule cell progressively perponderating in number. Dr. Hughlings-Jackson long since supgested the representation of seas? muscles by small cells, requiring as they would, in their almost ceaseless lively activity, capid and frequent, though short, discharges of energy; in fact, he regards such small elements as necessarily of unstable equilibrium. His words are as follows:-

"I have suggested that the size and shape of cells, as well as their nearmost to the immour, or other source of irritation, will have to do with their becoming anothing other things equal, the same quantity of matter in energy small cells will present a vastly greater surface to the contact of noticent subtreat than the annoquantity in one large cell. I have also suggested that small mancles, or, more properly, accommon which require little energy for the displacements they have to effect (there of the hire and of the bands in bands, for example), are represented by small cells. Such movements are supidly changing during many of the

^{*} Dimenson of the Newsona System, etc. in., p. 36, 1881.



Pag. L.



F10. 2.

CORTEX OF PIGS BRAIN, TWO DAYS OLD. SUBLIMATE PREPARATION.



operations they serve in arriving, for example—and require repetitions of short. Electricism of energy, and accommitte quick recoperation of the cells concerned. Movements of the upper new new, in comparison, little changing, and require parallelest steady Electricis of energy."

When, however, we comider the assumed sensory element of the cortex-the minute angular and granular cells-we must not lose sight of a remarkable distinction between them and the assumed motor unit, and that is, the great proportionate preponderance of the nucleus to the cell itself in the former. That the nucleus does exert some mysterious influence over the nutritive and functional activity of the cell has long been variated; and the results of our histological inquiry indicate that nuclear degeneration within the nerve cell in peculiarly associated with certain states of mental and motorial instahility. We have long been accustomed to regard it as related more definitely to the functional activity of the cell, and less directly related to the nutritive notivity of the cell. In other words, the cell is subject to a constant supply of autritive plasma-it gradually assurees a state of autritive instability, and will necessarily discharge its accomplated energy in accordance with the simple law of nutritive rhythm-the resulting stable equilibrium is wecooded by a measurable period ere the potential energising of the cell has once more brought it up to its former state of instability. Were this all that occurs, the process of storage and liberation of energy would be a simpler rhythmic process than the more compounded shythm which actually pertains to mental operations.

If, however, we regard the nucleus as affecting the functional activity of the cell, as in fact, restraining or inhibiting its discharge, as a kind of imperior in imperio exercising a controlling influence upon the perturbations which reach the cell from sensory surfaces : then the presence of a healthy nucleus would become an all-important feature in the cell-life-a feature of the utmost significance to us in our pathological enquiries. What really does occur when these nuclei are especially affected by mortid processes, we shall refer to more particularly in our chapter on the epileptic neuroses. The view we have here taken of the significance of the nucleus would lead to the conclusion that when, from its degeneration or swellid state, it fails to inhibit the cell, these nerve elements would be subject to a rapid running-down on trivial excitation, and in service obedience to the law of nutritional rhythm; in fact, we should here find an explanation of morbid instability such as, e.g., in motor realms results in convulsive states, and in the substrata of mental operations in varied psychical states and reductions in consciousness.

^{* &}quot;On Tempomery Parallysis after Epsleptiform and Epsleptic Senteres," Scarie, vol. in., tectnore to p. 436.

It is these considerations which induce us to regard the disproportionately large nucleus of those small angular elements of the accord layer of the cortex as being of some significance. Subject as such minute cells are to a rapid accumulation of energy, we might pressure that some restraint must be established to prevent their reckless liberation of energy, and, hence, we believe such restraining capacity to be afforded by the very large nucleus. In the next place, we have every reason for believing that this superficial belt of angular cells is in direct functional connection with the subjacent cells of large size, and that their morbid instability would, therefore, affect these larger units, which, from the small size of their uncleus, would be sizes subject to the law of nutritional rhythm in their discharge of energy. As indicated by Dr. Ross, and also in the preceding note by Dr. Hughlings-Jackson, the large cell would present a far smaller area In contact with nutrient material than the same amount of protoplasm broken up into numerous minute elements; and hence, such large cells would labour under nutritive disadvantages-would be reservoirs for the slow accommission and storage of energy, which, when liberated, would again result in a tardy re-instatement of autritive instability.

Electrical Excitability of the Cortex. - Princh and Hinig were the first to demonstrate, in the year 1679, the excitability of the cortex in animals to the galvanic current; and three years later Prof. Ferrier. proscuted with the familia's surrent his first investigations into the functions of the cerebral hemispheres. The method of stimulation employed by Perrier was, to use his own description, "The application of the electrodes of the secondary spiral of Du Bois-Reymond's induction coil, connected with a cell of the mean electro-motive power of one Daniell. The resistance in the primary coil was such as to give a unitimum current of 1-9 absolute unit, as estimated for me by my colleague, Professor Adams. The induced current generated in the secondary coll at 8 cm, distance from the primary spiral was of a strength sufficient to cause a pungent, but quite learnble sensation when the electrodes were placed on the tip of the tongue." * We can but beieffy symmarise here some of the more important facts eligited by these experimental methods respecting the reaction of the cortex to electric stimuli.

Latent Period of Stimulation and Summation of Stimuli.

It is from these phenomens we infer that the certical areas found to be excitable are really centres, in the proper acceptation of the term. It must be remembered that a gaughinaic centrum is an elaborative structure, and that stimuli applied to it meet with delayers the resulting response be effected. The excitation of a centre is therefore accompanied by the time element seen in nerve stimulation in a marked

^{*} Functions of the Brein, 2nd relition, p. 223.

degree, and this is very approciable in the stimulation of the so-miled psycho-motor centres of the cortex. This is well brought out on contrasting the effects of a carefully-regulated current applied to the cortex of this realm, with the effects of the same current as applied to the medullated strands immediately beneath, by first excising the overlying cortex. In the first place, we find (after, of course, abstracting the time required for transmission down spinal cord and motor nerves and the latest period of the muscle) that the retardation is 0.045 of a second, and in the latter place, 0.03 of a second (Pranch and Pitres). So, also, if very feeble atimals be applied to the cortical centres their summation occurs, so that no contraction takes place until several stimuli have been delivered. Of the many interesting facts revealed by the researches of Schäfer and Horsley, Franck and Pitres, relative to the effect of electric stimuli on motor centres, the more important may be stated as follows:—

- (1) In the same animal the number of stimuli per second requisite to produce a continuous contraction is always the same for cortex, motor nerve, and muscle.
- (I) A continuous contraction does not occur on stimulating a motor centre, until the rate of stimuli reaches 16 per accord; below this, single contraction occurs for each shock or thereabouts.
- (3) The contractile rhythm of muscle, whether it be cortex, corons radiats, or spinal cord that is stimulated, has been shown to follow this rule:—

Rhythm of stimulus below 10 per second a numeralar rhythm identical. Rhythm of stimulus at above 10 per second a numeralar rhythm constant.

and independent (Schafer and Horsley).

Rhythm of attender about 46 per second a continuous prescribe contraction (France) and Pitros.

(4) The migscular curve of cortical stimulation is less sudden in its rise and more sustained than the curve shown in subcortical stimulation, and all voluntary muscular contractions show a similar rate of undulation in the muscular curve.

Hodifying Circumstances.—The excitability of the cortical areas is subject to great varieties. Thus, o'glerent animals vary in the intensity of atimulas required to produce the adaptive movement; and the same animal will vary from time to time as regards this susceptibility, according to the conditions in which it is placed. Severe hemorrhage greatly reduces or even abolishes, whilst moderate loss of blood scalts, the excitability of time parts (Monli, Nicoly). Prolonged exposure and atimulation rapidly exhaust, whilst apnoen, and the deep narcosis of chloroform, other, chloral, and worphia abolish it (Schiff), so that all animals completely anesthetises fail to reveal such excitability. So if the

cortex be in a state of inflammatory irritation, its excitability can be readily aroused by even mechanical stimuli, which in health have no such effect. In new-born pappies, Soltmann obtained early response to stimulus, of the excens reliats, whilst it was not until the sents also that he was able to obtain such response by stimulation of the motor certex.

Functional Equivalence,-Some authorities have inclined to the belief that a process of functional compensation occurs when injury, disease, or experiment has removed a motor centre; that either the opposite sound homisphere, or even some other portion of the same bettisphere, may assume the functions of the area destroyed. It is undoubtedly true that centres hilaterally associated and least independent recover soupest from a losion of one centre, and are beat effected in the issue, as is indicated in the history of all cases of ordinary hemiplogia; but this can scarcely explain what we meet with in experiments on dogs. Here it has been shown that if the motor centres of one bemisphere to destroyed, the resulting hemiplegia is seen recovered from, and if this were due to the substitutional activity of the other benisphere, attation of the centres in the latter would presumably paralyse toth sides. This, however, is not the case; for, as Carville and Durst charly proved, the minutated power of the limb first paralysed is not affected by the ascend operation. The explanation is, therefore, not one of functional substitution by another region, but is really due to the more automatic character of the movements in these minals; in other words, these movements are for more dependent upon the activity of lower centres and are less represented in psycho-motor or certical realms. In man and the mankey such movements are brought more under the control of the velitional centres-they are removed, as it were, to a higher plane of activity, are less natomatic, more independent, and their removal by disease or injury is followed by absolute paralysis of the opposite members.

Phenomena of Electric Stimulation of Cortex,—Professor Ferrier gives preference to the faradic atimulation of the cortex, rather than the galaxnic, since the first requisite is a stimular of a certain duration, and not the momentary effect of the opening and closing of a polyanic circuit; the latter also has the further objection of inducing electrolytic decomposition of the brain-carface if its action be long sustained. If the increasity of current be greater than accessary, diffused atimulation occurs, so that neighbouring areas are aroused into consentances activity.

Extra polar conduction has also been proved to occur by Carville and Duret, as seen in contractions of a frog's gastroenemias, the sciatio nerve of which rested on the occupat of a brain, the motor area of which was stimulated. This fact, however, does not vitiate the results of a minimum current applied to the motor cortex.

Conduction to lower centres, as the hasal ganglia, has been by some assumed to be explanatory of the results of atimulation of this motor area. This argument is, however, wholly disposed of by the fact that (i) direct atimulation of these ganglia (corpora striata) results in entirely different movements, not the adaptive, purposive movements which the psycho motor centres elicit; and that (2) when we bring the electrodes upon their immediate superficial aspect, at the insula, no response whatever occurs. As might have been surmined, the radiations of the coronal medalla, entering into connection with the motor certex, are in like manner functionally differentiated; and, as shown by Burdon-Sanderson, when the certex is removed and they are stimulated, similar purposive movements can be called forth.

Proximity of Psycho-Notor Centres.—It has been seen that the so-called motor cortex, distinguished by the nested cell-groups of the fourth layer, is so distributed as to occupy distinct areas, separated only by narrow intervals from each other. This fully accords with the fact that the phenomena of electric stimulation of the cortex demonstrate the close proximity of wholly distinct centres, as Professor Ferrier remarks—" Areas in close proximity to each other, separated by a few millimetres or less, react to the electric current in a totally different manner."

* Low nit., p. 229.

PART IL-CLINICAL SECTION.

General Contents. States of Depression—States of Resiliation—Fullmenting Perchases—States of Montal Enfectionent—Becarrent Insusity—Epiloptic Instalty—General Parallesis of the Insuse—Alreholic Insusity—Insusity at the Periods of Palesty and Adelesies — At the Paraperal Period—Δ1 the Chronelesis Epoch. Sends Insusity.

STATES OF DEPRESSION.

CONSTRUCT - Mental Depression Defined - Derline of Consciousness - Rise of Subject Consciousness - Mescalar Element of Thought - Faliare in the Balatical Element of Mind - Sense of Environmental Resistance - Reductions to Automatic Levels - Sense of Effort - Restricted Voltice - Enfection Engresses there easily resistance - Transformations of Identity - The Physiological Aspect - Defocitive Circulation - Naturitional Impairment - Explosive Neurose - Bunger of the Bruin-Cell - Painful and Presentals Mental States - Exertine Time is Melandodia - Degrees of Mental Degrees - Circula Varieties of Melandodia - Simple Melandodia - Polymoral Melandodia - Repochendrical Nelandodia - Melandodia - Resistance of Mental States - States and Hypothesis - Acute Degreestia.

PAINFUL mental states are of course sorsial under certain conditions in health and sanity. As in the intellectual sphere it is but human to orr, so in the emotional sphere it is but human to suffer, and to feel scattely : hence it is not the intensity of mental pain (although this is often far greater than in healthy states similarly aroused; that characterises this phase of disease, for if the anguish be the outcome of commensurately painful circumstances, we regard it as but a natural reaction. It is in the fact that the emotional atorm is out of all proportion to any exciting cause, that we recognise the departure from the standard of health. It is essential, therefore, that we carefully inquire into the antecedent circumstances of our patient's disorder, so as to determine whether there are adequate causes to account for the distress apparent—if so, there is but normal physiological reaction, and cerebral function cannot be regarded as deranged. If, however, the mental pain is the result of trivial exciting agencies, if moral or physical agencies arouse emotional states out of all proportion to what would occur in the healthy mind, then we infer that the grey cortex of the brain is so far elisordered as to functionate abnormally, and we speak of the result as pathological depression. It is clear, therefore, that our chief difficulty in distinguishing normal from abnormal states of depression depends on our correct estimate of the correspondence of emotional states and their excitants, due allowance being made for special peculiarities of temperament. We cannot apply the same rule to a callous, unemotional nature as to one refined and sensitive.

In our search for adequate causes we do not confine our attention to the patient's environment; we must look for possible moral agencies, such as shock, disappointment, demestic affliction, together with physical agencies, such as injury, disease, privation, or, again, overstrain of mind, or vicious habits of life-in all slike, the rest cames are centric, and consist in a disordered function-the incapacity of rearting commensurately in the conditions in which the organism is placedin physiological terms it is a "disperportionately excessive" reaction. "The melancholia which precedes insanity is distinguished from the mental pain experienced by healthy persons by its excessive degree, by its more than ordinary protraction, by its becoming more and more independent of external influence, and by the other accessory affections which accompany it" (Grieninger).4 By one thoughtful writer it has been suggested that melancholis might be spoken of as a homologous, while mania and monomania might be termed beterologous affections. This, of course, would imply a quantitative and qualitative distinction; but, since emotional and intellectual states may be disordered qualitatively as well as quantitatively, the parallel is scarcely applicable. Emotional disturbances as the result of disease differ from the normal reactions of health, not only in volume but also in nature : as Herbert Spencer indicates, the correspondence may vary in two directions, quantitatively and qualitatively, in degree as well as in hind.

With respect to the non-relational feelings—the appetites, pains, its—Herbert Spencer says :—"Their great indefiniteness of limitation and accompanying want of cohesion forbid unions of them, either simultaneous or encessive. Obviously, the emotions are characterised by a like want of combining power. A conduced and changing chaes is produced by any of them which coexist." This very want of relativity, this dissociability and absence of a tendency to form strong coherent groups, at once account for the comparative difficulty of estimating the degree of mental alienation in reclambolia, as contrasted with states of delimion, where we are dealing with definitely measurable factors.

Simple pathological depression is unkered in by that failure in object-consciousness which invariably imaggarates a corresponding rise in subject-consciousness; and which, we have reason to infer, implies a distincted functional activity in those realms of the corebrara correlated thereto. The patient exhibits a growing indifference to his former pursuits and pleasures: the ordinary duties of life and bissiness become inknown and devote of interest; especially do all forms of mental exertion cause ensur and distante—the attention caused as

^{*} Mental Discrees, p. 216.

[†] Papchatayuni Medicose, Backetili & Tuke, 3rd edit., p. 840.
Penacipha of Psychology, vol. i., p. 127.

formerly be directed without under effort, and so reading becomes laborious and thought sluggish and measternous. The environment fails to call up plenerrable associations—a dreariness and glosen pervade the entitide world, since it is interpreted in terms of the productionant feeling. All aspects of object-consciousness alike indicate the negative state. There is a want of vigour in the representation of the surfreement, and feelings aroused thereby are at a low ebb.

Corresponding to this there is a rise in subject-consciousness, shown in the prevalence of painful mental states—the senfounnance of gloomy emotions. This is the positive aspect of the patient's mostal state, and this aspect is the one which chiefly altendes study upon our notice. It is characterised especially by an all-prevailing gloom, varying in degree from mild depression up to acutely painful mental states. The subject may complain of vague maxiety - a feeling of some impending exil-an indefinite prevision of coming sorrow, which gives its own colouring to objective existences: he retires from social converse, which but adds to his irritation and mental distrem, gives himself up to introspective states, in which he dwells upon the present contents of his mind, broads over his morbid feelings, and falls into long reverses, the subject matter of which partakes of the same gloomy colouring. He is hyper-sensitive over triffes, irritable and impatient, or his querulous humour may alternate with sullen silence and obstinacy. Even in this reticence and retirement from social responsibilities, this growing apathy to all around or feeling amounting to dislike or direct hostility, we recognise the origin of that subjectivity, that equintic state which, in more advanced affections of the mind, conjures up delusions of encruachment and persocation.

In every case of mental depression we have this duplex state to study—the negative affection of abject-consciousness, and the positive affection of subject-consciousness.

Grissinger also asserts that forms of mental depression are due to states of cerebral deviation and mental excitation; but he apparently fails to recognise the duplex inture of the phenomena in neglecting the distinction between the two realism which comprise the totality of consciousness. Thus he says:—

"In employing the term, 'exacts of mental depression,' we do not wish to be guidenteed as implying that the nature of these states or conditions consists in mastim and treakness, or in the experience of the records or correlate phenomena which accompany them. We have much more trace to assume that very violent states of irritation of the brain and emitation in the mental processes are here very often the country but the guestal result of these (mental and serviced) processes is depresses, or a painful state of mind. It is sufficient to result the samingy to physical paint; and to those who singers they make things better by substituting 'correlant torpor and 'correlant minutes.' is 'depression' and 'emiliation,'

It may fairly enough he objected that in melancholia there is also a state of irritation," *

Had he asserted that both conditions to existed, a state of cerebral torpor in the physical substrata of object-consciousness, and a state of cerebral irritation in the substrata of subject-consciousness, he would, we think, have faithfully recorded the morbid phenomena. The secretal variations in these antithetic halves of consciousness, with which reverse and dreamy states render as familiar, have been thus lacidly expressed by Harbert Spencer, when in reference to the vivid and faint aggregates of consciousness he mays:—

"Though entire unmanagement of things around us is mostly if ever reached, yet the reactionness of their may become very imperfect; and this imperfect consciousness, observe, results from the independence of the faint series becoming for the time so marked that very little of it clings to the vivid series."

Decline in Object-consciousness,—The various states of consciousness and the changes from one to the other constitute collectively the sole elements of mind; and our considerations, therefore, apply to feelings and the relations between feelings. First, let us note that the sariations from the normal state embrace a quantitative and a qualitative change. Feelings may encosed each other in rapid order, or in alon, monotonous file, they may arise in serial order, or numbers of disconnected states may simultaneously thrust themselves into the field of consciousness, preducing turnool and indefinite vague emotion and thought. On the other hand, mental phenomena may exhibit a qualitative alteration, such as, e.g., is shown in degrees of intensity of feeling, or again, of definiteness as due to the sure or less relational character of the preduct. The decline in object-consciousness which occurs in states of pathological degreesion, such as we are now dealing with, presents us with the following features:—

(a) Enfectivel representativeness; (b) a leasured seriality of thought (weakened attention); (c) diminution or failure in the associate element of thought.

The last appears to us so important a factor in these murbid states, as to demand here somewhat cureful and detailed consideration.

Failure in the Muscular Element of Thought.—The constant accompanisment of depressed mental states is a diminished range of perception; and, since every perception is a complex phenomenon of composite states of conscioumens—if one or other of the executial elements of an idea or of a presented object be wanting—the definite realisation of such object or idea is defective. The ions may be in the more sensions element of the perception—in those qualities, in fact, of body which are categorised as dynamic ("primordial"), e.g., colour,

^{* &}quot; Mental Discusses," Syd. Soc., p. 210. † Principles of Psychology, vol. 11., p. 439.

colour, taste, or the pure sensations appreciated by the specialised senses of sight, hearing, taste, or smell; again, the less may pertain chiefly to the statical or primary attributes of the perception—those of size, position, form. A vigorous perception of these primary or space attributes of body is dependent largely upon our "sizeh" or muscular sense. If, therefore, this sense undergo any dimination, so will the space attributes of body become less vividity conceived—the cognition is but feely produced. The sense of sight is pre-eminently interwoven with the muscular mechanism involved in our perception of objects; and, since the retinal field can only receive the impress of these dynamic attributes of body by means of a musculature, which rotates the cyclail and so disposes the visual axis suitably, the knowledge of such movements, comprising figure, bulk, and position in space, becomes ineatripably blended with these dynamic attributes.

There is little doubt that the revisal impressions are, in states of melancholic depression, but feebly produced; but whether the securifier element of preception is first or simultaneously affected, is an enquiry of special interest. And here we must distinguish between that portion of the someular element which enters into our higher intellectual concepts, and that grosses factor of the large musculature of the limbs, he, which subserves the purpose of locomotion and coarse movements. The sense of muscular contractions which forms the basis of the prinordial ideas of form, size, position, lapses eventually in consciousness as a pure sense of muscular contraction. With the larger musculature this is not so; it is essential that the movements of the limbs, their contraction, and tention should be exquisitely registered centrally, as thereby alone can we gain an idea of their position in space spart from the sense of night, and appreciate the relative weight of objects and the resistance offered by these. The unrestrained action of those muscles signalises to our minds the absence of external resistance, and the rise in the muscular sense which accompanies my resistance opposed is the direct measure of such resistance. Similarly, with the "muscularity of thought," which in the normal state is of free and easy play, the rise into consciousness of its princedial muscular element means effort, and at once suggests to the mind the same notion of resistance in the environment. It is obvious, we think, that the muscular element is the first to decline : for cases of intense grief, as from a sudden mental shock, are associated with a notable contraction of this sphere, and space dimensions are altered and contracted. This feature is one of importance, since it clearly points to the decline of the mere relational elements of the perceptive process.

The relations of hells, configuration, and position are recognisable redy by the intellectual operations of the mind, and it is this intellectual element which is

earliest subshied. This follows, therefore, the inverse order of the evolution of psychical powers. Misseafar sense, which appears much later in the evolution of the nervous system than do the general or the specialised semantics of sight, houring, its, is in morbid states the first to secureby. The infant learns to approxime the colour of an object long before he has received the visual pureption of its form, bulk, and position: he learns to recognize sounds ore the direction whence they proceed establishes the organized series of reflected changes in certain nuclei of the modella, which mables him to turn the head and bouline the course of such sounds.

Just as in the infant we trace the senspous element of mind as preceding in evolution the relational element, so, in dissolutions of the nervous system in the insane, the inverse order is followed, sad the relational decline before the sensyons or "primordial" sensations: and, since a relation can best be defined as a state of consciousness "holding asgetler other states of conscionness" (Herbert Spencer), so individual conscious states become dissociated or unrelated. The loss of such relational element implies a certain degree of intellectual torpor; but, as we shall have reason to use, the nease of volitional freedom, which is probably an abstract product of the muscular sense, must in like manner declins. Our vigorous perception of the cutside world depends largely upon vivid states of consciousness : our realisation of such related states by muscular sense and its derivatives may be compared to a mental grasp of the environment; and, in direct proportion to the vigour of such grasp, does our power over the enviremment predominate, and the resistance of the latter diminish. In states attended by decline of the nuncular ce relation element of solad, therefore, external resistance must be puri power intermified, and the apparent energy and freedom of the soil restricted.

Let us analyse this component of ideation more thoroughly, and we shall find that not only is every perception evolved from a series of complix related states of consciouness, but that every concrete perception or idea is attended by certain civid primary states of consciousness and other accordary component impressions which fail to rise into consciousness. or are more or less revisable or representative. Now such unconscious components of an idea which we take, so to speak, for granted-these lansed states of consciousness, although they form an integral component of the perception or ideal representation, are chiefly of muscular origin. If, in every conception of a sphere, the roll of the eysball on its axis were induced, the objective origin of the perception of its form would be evident; but, although such actual muscular movements do not occur, yet the musculatures productive of such movements have their centres innervated by each such perception. Still, such innerestion as a direct muscular state or sense of muscular tension and movement fails, in health, to rise into consciousness—an automatic play calls up vivid representation of form and figure without

any consciousness of muscular action or strain. As before stated, the frequent repetitions of the muscular act emential to the knowledge of figure, position, &c., have eventually resulted in a lapse of the same muscular action in consciousness.

If, however, delay cours in the production of such relational states, the statical attributes of body will be perceived only after conscious effort; even actual mineralar movement and the tension so brought about for the realisation of more vivid rensertion of form, configuration, and bulk, will give that sense of strange effort which metes out to us the resistance of the environment. Do setual nuncular movements occur in the downged states with which we are now concerned. and does conscious effort thus arise upon planes which are normally devoid of such feelings! The melanchetic exhibits to a notable degree the effort which it causes him to think, reflect, or attend to what is said, or to what he reads. It appears to us that the true explanation is due to mental operations being reduced in level so for as to establish conscious effort in lieu of the usual unconscious operations, or lapsed states of consciousness which characterise all intellectual processes. The restless movements of the intellectual eye (in the artist, post, &c.), as well as those of the state of maniscal excitement, bespeak in the former case the exalted muscular element of thought, and in the latter a highly reflex encitability; but in the melancholic these muscles of relational life are usually at rest, the eye is fixed, dall, heavy, sluggish in its movements and painful in effort, the syelids are dreoped, the limbs motionless. The only muscles in a state of tension are those which subserve emotional, and not relational life, viz., the small muscles of expression.

Hence, the failing vigour of representative states aroused in simple perception or idention, instead in the sentiment of objective resistance. The environment encroaches part point with the failure of that faculty whereby the mind projects out of stadif, so to speak, an environment, or revives in idea impressions received from the environment. It is the motor element of mind which is here at fault—the relational element of thought, since it is the space attributes of bodies which are involved. Now, since is the appreciation of these attributes of healy (form, bulk, do.) the subject is active and the object passive, it results that the motor constructive element of the idea is the one which suffers. In other words, failure in the muscular element of thought has as its results on the subjective side, enfective idention and the sense of objective resistance.

With respect to the sense of resistance from the environment, it is of interest to note its artificial production in the reductions of consciousness by the agency of amenthetics. To any one who has been amentheticed, and who recalls his experiences, say, with nitrous

oxide, it must be obvious how the environment crowds in upon one more and more, and how the ego, or personality enclaves by its power, finally feels that thought itself is successful to its resistless advance.

Restricted Volition.—As in the sphere of perception, so when taking into account consciousness in its totality, we likewise find the same failure in those complex muscular centres, which, in their adjustment to the environment, issue in what we term conduct. All volitional acts categorised under this bead are the resultants of many factors, or rather the result of the struggle between many contending forces. A certain line of conduct or a certain action being determined upon, presupposes the representation in consciousness of the several possible lines of action. This, in other words, is equivalent to mying, that various feetile motor excitations are represented in consciousness, and that the stronger the aggregate of excitations in any special direction, the more does it tend to issue in action. Volitional actions are hence preceded by nascent motor excitations. Such excitations are the basis of the act represented to the mind in ideas which more or less rividly precede the act as realised.

In this condict volition may be enfectled as the result of failure of those initiative emotions, desires, and sentiments which are in abeyance in states of depression; or it may be convulsively restricted as the result of two opposing antagonistic forces, as when such groups of motor excitations divide the attention between them, and the mind ways from one to the other in hesitation and doubt; or, again, such motor excitation as forms the impulse to action cannot be definitely and strongly represented, and this enfectionent of muscular representativeness issues in apathy and inaction.

A clearer conception of the resultant phenomena may be gleaned by contrasting the voluntary and the involuntary or automatic acts. In the latter, the ideal movements have lapsed in consciousness—the stimulus, whatever it be, is followed so rapidly by the appropriate reaction that the mastern motor excitations do not rise into consciousness. The start of surprise, the suddenly assumed attitude of self-defence, the mechanical movements employed in conveying food to the mouth, and the musticatory actions following thereupon, as well as other complex though automatic acts, have no initial motor autocedent represented in our consciousness; yet all these movements are exquisitely coordinated and rapidly excessed.

In the enfectionent of motor representations preceding visitional arts during states of depression, the actions themselves, if performed, are aluggish, mechanical, and devoid of normal energy; and herein lies the distinction between healthy automation and these abnormal states. The distinction is more important than at first eight may be apparent, for upon it hinges the explanation of the automatic freedom of maniacal states, which implies, as we shall see further on, a grave and more serious reduction. The spathy and sloggosh reaction of melancholia appear in part due to this want of eigeness score representation; the true characteristic of a normal and pigerous solad is the vivid realisation in consciousness of the action or line of conduct to be pursued—the ideal recognition of all alternative lines of conduct by the contracting faculty, together with the representations of similar actions previously performed, with the result as affecting the organism.

In normal states, each group of the feelings which we class at desires and sentiments rapidly build to swell the aggregate of its own motor excitations: so rapidly does this natural attraction of "like to like" go on, that the contracting faculty whereby the result is obtained appears often to set with incalculable rapidity by a process which Speacer calls "automatic segregation." This process is impaired in states of depression, and becomes sluggish, feeble, and hesitating. Those faint summations of falsal movements which are aroused as the incitants to relitional acts may mutually antagonise each other; and their very want of vigour will of itself neutralise that distinctive quality which enables the one group to preponderate and overcome the other in action.

To employ a figurative (Instruction—thus do we witness in the surging take advancing upon a rocky shore, two waves diverging at an angle; the one, receiving fresh impulses from minor wavelets which take the same course, swells into a pissing creat; the other, receiving no abditions, subsides enhanted. Or, two such waves of different size advancing the one upon the other, the higher, representing the aggregate swing of sumerous includations, accrosses and carries with it the surging slaments of the weaker. Or, again, to illustrate the bothle representations alluded to, let us picture the uniform ripplets advancing by thousands on the surface; from want of co-operation, each maintains its own distance from the other, no great contrasting aggregate of movement in formed collecting to itself stray pulses of force, and hence all ables some to the slove with similar imagnificant results.

Want of vigorous representation, enfeebled contrasting faculty of thought, antagonistic tendencies, or, lastly, recession or restriction of those feelings which normally excite to voluntary reactions may one or all take part in that restriction of the ego which we speak of as a restrained volition.

Here, again, we have suggested to the mind that resistance of the environment which inevitably results where subject-consciousness has a diminished range. It may at first sight appear contradictory to speak of a full in object-consciousness and a rise in subject-consciousness as issuing in a sense of resistance from the object-world, and a state of enfected subjectivity: this is, however, the case, since the less definitely the mind conceives of external realities, the less vivid their representations—the wider the margin for doubt, suspicion, and ideas

of encreachment from without. We fall to gousp the environment: we do not know it, in the sense of measuring our strength against it—and hence are fear it.

Bo again, the enfections not of subject-consciousness pertains only to that "faint aggregate of conscious states which the vivid aggregate toads to draw after them into being" (Spenorr), vin, the ideas connected with the outside world, and the representation of our reactions upon the same—hence the faculties of ideation and solition are impaired. For otherwise is it, however, with the more sentient element of the self-consciousness—that mass of bodily sensations, visceral, respender, articular, cutaneous, and the feelings and emotions and sentiments which in the aggregate constitute the sentient or passive ego—it assumes a concentrated and exaggerated intensity, and this is what we refer to as the rise of subject-consciousness as distinguished from the decline of object-consciousness: a truly self-analytic state.

Failure of Personal Identity.—If, now, we attempt to trace further the decadence of mind, in progressive forms of mental disease, we arrive at a very notable stage, and one of profound import, when the failure of object-consciousness is so far advanced as to lead to alterations in the patient's notions of his relationship to the outer world, and to a confusion in his own identity.* A considerable difference is observable in these cases of confused identity, but the more important distinction appears to exist between—

- (a) Guars of transformed identity associated with general feelings of regard or good-will to the outer world, and a universal some of wellbeing, or, at all events, a complete indifference to the environment; and—
- (b) Cases where, with the transformation of the ego, the environment or soccepo is also transformed in the patient's mind into a formidable, encroaching, and persecuting for; whilst all its manifestations socially tend to call up a sense of repugnance and bostility. The ego may exist as a double personality, each independent of the other, or the one awayed by the other, and otterly dissentient in their nature. We need not here deal with these minor differences, but rather consider the development of the latter class, where the identity is transformed and the non-ego is estimated in terms of the malign. It is well, perhaps, at once to state, that these latter forms appear to us to sate out of the various melasologic types of alternation, whilst the former are educts of the more purely succiously affections.

How does this injuterious transformation arise? The ego is constituted by the vast aggregate of somutions derived immediately from the body, which are a complexes of all grades of seasony manifestation,

^{*} See on this point especially Bibot, p. 163-110; also Griedinger's Montal Disease, p. 50; cf. Spencer, Sully.

from visual and other special nerses to tactual and general sense, we well as the far less definite organic or visceral sensations.

All those ingoing currents which arouse, more or less definitely, our knowledge of the existence of a lody, its timbs, musculature, and viscora, conjointly aid in the slaboration of the ego or personal identity. But the ego is far more than this. We must associate therewith those representations of the same, and moreover the "joint approprie," as Spenses terms it, of states aroused by presentative cognitions of the outer bosmos.

Our sentiments, ideas, emotions, as well as our memory of presentative states, all alike go to form that complex elaboration—personal identity, which is severed sharply from the "vivid aggregate" known as the non-ego—the physical in contradistinction to the physiological environment. Now, since in all normal states, the internal order bears a definite relationship to the "outer order" of things, when either of these is profoundly distorted, the identity tends to suffer considerably, as indicated by Sully. We are all acquainted with transient confusion of bientity, in those waking states when we full to realize the impressions enthbuly received from the environment; and were the latter completely and suchlealy transformed, we should fail to restore immediately the balance necessary to re-establish our own identity.

So, when the internal mechanism is deringed, and the orderly relationship of inner to outer knienus is confused, personal identity is and correspondingly to suffer. We have already seen how this may seem in the progressive failure of object consciousness.

The failure to appreciate external relationships, again, is associated with that gathering gloom, that sense of outward resistance, fear, and insecurity of the non-ego already alleaded to. Impressions from the enter world fail to arouse the normal representative states of cognition, but aid in the welling-up of the emoliousity of the subject, and it is from this fatter source that falsifications of sense areas.

As subject-countousness becomes more and more pronounced with failure of object-countousness, all impressions alike, received from the nonego, become the pubulum for the growth of an all-pervading egoism. The uniquet broads over his multiform and novel feelings morbid introspection and egositic musings replace the healthy altruistic feelings and sentiments: and, since the constional life is itself in part the origin of representative cognitions of the outer kosmos, as our of this source there now write finisfications of the environment.

The purvailing gloom, the sense of objective restriction, and the emotional states so aromed, attract to themselves like groupings of ideas—"attempts at explanation," as Griesinger has it, and this state progressing, tends eventually to the establishment of a new nexus of ideas correlated to impressions received from without, in lies of the old and normal relationships pre-existing. It would be a falling to measure that the falsifications of the environment preceds the emotional disturbance, or that delusions of persecution beget gloomy and malignant passions—this would really invert the actual sequence of phenomena. A gloomy emotional background begets a gloomy interpretation of the non-ego, and all delusions of persecution are beget in like manner out of disordered emotional states.

Such translations, if we may so speak, from constraint realiss to the realiss of thought are, even in mercal states of montal life, of frequent constraints; they peculiarly characterize the poetic faculty, and distinguish the purely emotional and imaginative from the intellectual type of mind; but, where such constronal instants to thought are in themselves the product of moreid action, the intellectual result of such operations is liable to be delenive and false. The more immediate concepts, as we may term those which are the result of pass intellectual operations, unanisted by, or only associated with, anothers a trace, are more substraints to accurate insect of legic: the more multiple concepts, encionally derived, are less emorphible to make machineles of classifying and grouping. Such concepts, in the morbid states now under consideration, are attenty illegical, unchantiable, fragmentary, and bettay but the objects another of a conception into d. It appears to us that each distinctions between the immediate and the mediate knowledge, to acquired in the case of the matter, are all-expertent in our conception of the general of these morbid conditions of the egs.

We have been tracing in these mental operations the transformation of the environment to the alter's mind: out of the old tissue, by a species of re-arrangement and reconstruction, is weven a fabric representing to him the reality of external things, and which to him is the celly reality, but, to his former state of sanity, is an utter falsification. Since this morbid concept is projected out as the actual kosmos, and since internal order must correspond to the external, so a transformation of the ego itself responds to this altered state—the former identity is lost and replaced by the new.

And here we have an explication of that newly-acquired freedom which, at this juncture, appears to dawn upon the mind of the monomaniac. No longer are phenomena in the outer world laterismly investigated and subsedinated to rigid laws of logic and of science—they pass, as through a magic crucible, the morbid times of his brain, and are transformed in accordance with no objective laws, but take their colour wholly from the merical emotional states present. Self-sections arise with wondrons celerity and of postess form; and the morbid imagination conjures up fantastic groupings utterly devoid of coherence and objective reality. A feeling of new freedom replaces the old one of restriction and aggression by the environment, and the ego is consequently endowed with new faculties, new powers—becomes a mighty potentate or a god. Scill, the environment is sadelitly stamped with the malign character which the former emotional state fostered, and it is only in late stages of the malady that such realiza-

tion of a new-got freedom entirely effices the entity of the non-ego from the mind.

Like all audden and extensive transformations of misel, the change thus delineated must be accompanied, as Griesinger has indicated, by great emotional disturbance, "as the results of the conflict between the old and the new." He says, referring to the new remations and instincts which become generated:—

"At first three stand opposed to the old I in the character of a foreign thos, often emitting assumement and four. Frequently their foreign extrance into the whole sphere of the perception is felt as if it were the possession of the old I by an obscure and treated by perception is expected by factable images. But this deplicity, this conflict of the old I against the new indequate groups of ideas, is always assumpation by painful opposing exceptions by emotional states, and by violent amortions."

It will be seen that we differ from the above statement, in regarding the emutional perturbation nor as the outcome of the "conflict between the old and the new ego," since it appears more in accord with the sequence of the phenomena to regard the morbid emotional storm of this period as being the direct origin of the newly-generated identity.

Reductions such as ensur from nervous dissolutions alone, can searcely explain the phenomena with which we meet; we must, in addition, suppose a process of re-integration to ensur.

The level to which the mental life is reduced is still one of active, nascent, mental life, † and, like all such ascent life, is accompanied by much constional disturbance. Even in these morbid minds there is no reason to suppose that the same process does not proceed which we assume to occur in profound along, where the re-energising in lower planes, while the individual is for the time unconscious, still proceeds, and no mental potentialities are unconsciously acquired. So also in the monomaniar, though the activities he thous of lower planes, still they indicate developmental activities, and those groups of sensations and ideas are conserved which are the fatest to survive: irrational as may be the beliefs, inconsistent the new concepts with the actual truth, still, as Hughlings-Jackson indicates, they are the best possible in the parient's state of reduction;

. "Mental Discusse," Syst. Soc., p. 50.

† Dr. Hughlings-Jackson has repeatedly insisted upon the negative and positive results of spileptic esizures.

If We are prose, by the loose planeology of common life, to regard the subjective as a permission procession—to speak of our mind as a something beyond the single active contents of the moment and as the accommanded psychical activity of our total existence; as if thoughts could be bettled up permanently and anchangeably. It is the material substratum of thought—the organised percous pleases—which represents the permanent and the potential revivabilities of former experiences, as Herbert Spencer says:—"Just as the external series is that which continues to exist smill transitively appearances, so the internal series is that which regimes to exist smill transitively appearances, so the internal series is that which regimes to exist smill transitively ideas."—Principles of Psychology, p. 485.

As the tide of intellectual life retires, so does it well-up into emotional states; but such strotional wave must have its rebound, and this is expressed in the re-integration which persistes the mental organism with fresh ideas and concepts; and when such groups acquire a certain definite cohesion amongst themselves, we have the genesis of a new identity.

It is only at an advanced stage of dissolution that this transfermation of the ego can occur—we may safely assert that extensive connections between distant nervous mechanisms must be deranged or dissolved, ere that failure of association of ideas could occur which always precedes this morbid change. Fresh connections probably arise, through the newly-forced channels of the emotional wave, and new coutres of internal cohesion are begot and evolve the fresh atsociation of ideas of the transformed ego.

And here we might note what we shall later on deal with more fully -viz., those transformations of the personality which characterise certain critical or elimanteric periods of life-notably that of pahenty. It can readily be conceived how powerfully the mental life is affected by the re-integration of the new encroaching someations into fresh instincts, desires, impulses; or, as at the menopause, by the ablation, so to speak, of one of the strongest instincts of the nervous constitution, the sexual. Can it be a matter of wonder that, at these critical periods, the risk to the mental integrity should be great or that, in many subjects, permanent duringe should ensue! So intersusen are these instincts with the whole fabric of mind, that a complete transformation of the sentiments and feelings follows, as the resultof such incorporation. Obscure longings and yearnings, imperfect, mdefinite perceptions, emotional surgings which have no obvious origin or purpose, characterise a period of perturbation of the mental life, which may readily lead to misdirected efforts or morbid impulse and disease.*

The Physiological Aspect.—In dealing with states of mental depression, did we attempt anything like an artificial division of this class of the vessalise, it would appear to us more important to lay emphasis upon the merbid processes to which they are traced, whenever such processes can with justice be assumed. It is clear that the symptomatic indications of the so-called varieties of melancholis point not so much to a fundamental distinction in their essential nature as to one in their mode of origins they indicate quantitative as well as qualitative variations in the nutritive functions of the nervous centres, and, hence, are roughly divisible into groups, comprising those which arise from direct disturbance of the blood current, and those which are induced in the nervous tissues primarily.

^{*}See on this subject the section on the "Immunities of the Period of Puberomes."

Two groups stand strongly contrasted here; the one, in which a defective cerebral circulation is the core prominent feature; the other, in which an acute nutritional anomaly of the serve-centres expresses itself in still more unmistakable symptoms. A further group may be constituted by the various qualitative variations of the blood-plasma—toximia, &c.—a group conveniently placed between the two former.

D'Abundo has recently affirmed that the toxic and bactericidal action of the deliterinated blood scrum is much increased in all forms of insanity, except in mental depression, in which, on the centrary, it is lessened. His experiments demonstrated the fact that some 10 c. of scrum to the kilogramme of blood kills rabbits by scate intoxication. It by no means follows, however, that mental symptoms due to the products of auto-intoxication should bear any direct relationship to the toxic effect on lower animals of the toxic-scrum injected. The effect of certain poisons administered to rabbits upon the nerve cell and its histological constituents has recently been excelled by Nisal, very definite changes being induced in the serve cells of the spiral cord and brain by such agencies as alcohol, worphis, strychnine, lead, phosphorus, and arsenic.*

It will at once be evident that this is a very arbitrary grouping, the one condition being often associated with the other-nay, evolved out of the other. Thus, defective circulation leads eventually to grave nutritional anomalies, so that the symptoms of the first group may pass into those of the third, although the usual result is not its passage into the acute but into cleanic forms of natritional impairment. Again, quantitative and qualitative variations of the blood, affecting centric nutrition, may co-exist, whilst such natritional disturbance of the nerve-centres reacts ugain upon their blood supply. Yet this inter-dependence of functionally related systems, although it renders any sharp demarcation into separate groups impossible, does not impair the practical value of a division into the three groups, since it always holds good that we may clearly distinguish those affections in which the prominent audication is that of simple depresent circulation, from a state in which the estimated quality of the blood chiefly speeals to us, and, lastly, from those grave affections in which course and obvenic matrificual anomalies are the chief factors concerned.

States of defective circulation will comprise all the simpler forms of metancholia characterised by lowered cerebral activity. Excitations from the environment do not are use the normal reaction; they are sluggishly transmitted, slowly elaborated, and wholly fall to react with due vigour or purposive result. The registry of all impressions

^{*} Biniste Spor, di Freniorsia, vol. 2015.

is faint or imperfect, the latent period prolonged, the reaction-time delayed.

The very earliest signs preceding genuine pathological depression are really the symptoms of corebral anomia and nervous exhaustics. The cerebral functions are torpid, there is diminished activity both of the impressive and of the expressive realms of the certex, as above described, and negative states predominate throughout. The subject is heavy, languid, sleepy; frequent yawning occurs - not the inscessio of a more advanced stage; intellectual efforts are apprenive, and thought becomes dreasy, menotonous, and painful. If the warnings that afferded be disregarded, there arises the frequent recurrence of a painful idea, additional sensory hallucination, sleeplessness, all indicative of a commencing pathological change of impaired centric nutrition. In the earlier stage, where warning is not taken, and where, despite such slear evidence of cerebral subaustion, the louin is still made to so its saily round of duty, in a state utterly insidequate for such exertion, unless absolute rest he here enjoined, the next step will certainly issue in pathological depression. The merical nature of this change is sufficiently evident in the fact, that the durnal cycles of autritional raythm are frequently inverted, or at least gravely disturbed.

Viewed from the mental aspect, the highest parchical operations are first enfeebled; atateast thought becomes supressive or imposible; attention impaired or restricted; sensations are less visid, and perception is incomplete or wanting in detail or imaginative vigour-the representative faculty especially being enfoebled. Apathy and indifference to the surroundings, associated with painful gloom, persude the mind, hetraying the decline of object-consciousness and the rise of subject-conscionsness." In these states, the reaction on the outer world may be characterised by fitful irritability, impatient conduct, singgish, mechanical actions, or by entire appreciate of volitional initiative. Both sensorial and motorial functions are sluggish or in abeyance, and the functions of organic life are all depressed. The vitality of the organism as a whole, being largely dependent upon the activity of the persons centres, must necessarily suffer when this important regulative system is desurged; the condition is truly one of devitalisation-life is carried on at a lower level.

Should the nutrition of the nervo-centres suffer exclerisity, a fresh series of symptoms is aroused: illusory states and hallucinations distract the attention—the mental pain and disquict is intensified thereby: spathy and indifference may be replaced by timidity, fright,

[&]quot;So the corrects of an over-active circulation reveals itself in increased cerebral activity—often in extraordinarily vivid memories. This we see in fevers, also after the me of certain drugs, as spinus, faction, &c.—(Robot, Op. oit., p. 198)

or terror; and the reaction becomes expressive of such emotional states—restless movement and agitated demeanour replacing the former negative condition. All this indicates impaired nutrition of the nervecentres, owing to the defective supply of blood; the nerve-centres, owing to the defective supply of blood; the nerve-centre, improveriabed, exchange their normal functional irritability for an exaggerated abnormal explosiveness, and fitful irregular discharges replace the rhythmic cutflew of the nervous discharges which regulate the subcordinate centres and relational apparents of animal life.

These nutritional anomalies reach their climax in the third group to which I have referred, the explosive or fullminating psychoses. These affections are characterised by the suddenness and explosive nature of the nervous discharge, which releves the pentup and accumulating energy of highly mustable centres. In lies of the equable rhythm of discharge and repair, corresponding to the wants of the organism, and adapting it to its environment, there is disproportionate accumulation of energy | the centres are brought up to a degree of high nutritional instability, and the least excitant, however trivial, may, like the spark to the fulninate, issue in an explosion of serious intensity. The nerve pulse is irregular, fatful, intermittent.

This group comprises certain varieties of so-called impulsive insanity—the homicidal and suicidal—the sobjects of epileptic neuroses, and affections arising at the climateric system.

The cortical expanse of the cerebral hemispheres is certainly the site of the highly representative and re-representative operations; a defective circulation here results in a genuise starvation of the nerve-elements. How does this starvation betray itself? In replying to this sequiry let us briefly refer to the physiological appetites for food, &c., and parallelise them with the case in point; we shall then find that all animal appetites are dependent upon two smential factors:—

- (a) The reception of peripheral excitations by a centric register.
- (b) The supply of blood to this centre.

Thus, the sense of hunger is the indication of a want of this due excitation of the peripheral nerves of the gastric american membrane; and for its alleviation the centres must receive impremions as created. But excitation of the peripheral ends of the vagua, produced by any mechanical contact other than by the ingestion of aliment, temporarily suffices to restere the autritive equilibrium of the nervestres. The rhythmic pulse of excitations thus transmitted to the contram calls up the increased vascular this associated with all legals functionising—and thus, these two agencies combine to raise the nerve elements into their nerval physiological condition of satisfy. The reinstatement of indecolar equilibrium in the centric nerve cells sepends not alone upon the transmission of the physiological stimuli,

but also upon the collateral flow of thest to the part. So—as regards the special senses—the abelition of the usual afferent impressions begets a condition which is tenly a pathological honger. Strikingly is this the case with the sense of hereing; depression of spirits is a wellmarked phenomenon in unideally-induced deafness, partial or complete. The depression so induced we regard as a genuine instance of associal hunger—as the expression of starration of the nerve cells, thus deprived of the normal ingoing currents.

Sameness and monotony of sensory impressions produce identical states: and the want of "a change" is nothing more than the expression of this physiological hunger of the nerve-centres.

On the other hand, the more highly representative the special sense faculty is in its evolution—the less dependent is it in this respect upon presentative excitations; and thus the sense of right, when similarly affected, fails to indicate in the same notable degree a corresponding depression of the emotions-idealising or centric initiation so cosepletely supplementing the loss that the results are far different : yes, if the sphere of such operations is in itself implicated, if the nervous mechanisms initiating representative processes are started out by deficiency of blood, then there is begotten a corresponding lunger of the brain-cell. For, cerebral activity in these realms being restricted, as shown in the poverty of active idention and thought, there is an arrest of diffusion-currents provocative of the pleasurable emotional states which always accompany healthy energising of these outres. Corresponding, therefore, to the dreariness of thought in regultive realing, we have in the region of feeling such painful mental depression as accords with what we should term the hunger of the brain cell.

Again, those gauglionic structures which are the regulative o-notess for the organs of vegetative life, subserve the wants of the system through the agency of an inscrutable law of nutritional rostlan, differing for each organ concerned: yet, whether we consider the gauglia connected with the viscoral sensations, or those which receive spi-peripheral excitations, as those of the special senses—i.e., whether the physiological stimuli are continuously received, or have intervals of some duration, or, as in the case of the heart, are equable and periodic—in all cases alike, the excitation of such contres depends much in its degree upon a due supply of blood to the part; unless this be the case, the centre, exhausted by discharge and not renovated by due nutritional flux, must lose in its excitability.

Further, this enhancism means a recolerating of that associative affinity which areases correlative centres, and which in the physical basis of ideal association. In like manner, the directive agency of such auhausted centres must be enfoobled, and the blending of impressions and associated states into the "social line of thought" (Spencer) must be correspondingly unfeebled. As we shall see further on, this wearing of the cruic material into forms of thought becomes a greater and yet greater effort: "ganglionic friction," as Romanes aptly terms it, becomes arrestive of the higher processes of thought, and this constance in the intellectual aphore is associated with a diffusion towards the more purely emotional sphere.

Painful and Pleasurable Mental States.—Since these states form so important an element in conditions of mental depression and exaltation, it will repay us here to summarise briefly our views us to their nature.

Mental pain has been defined as the result of sender-action or overarrive-its antithesis, pleasure, finding a place midway between these extremes; as though, we might say figuratively, an ocean of sluggish waters and of stormy billows lay on each side respectively, with a midregion of rippling nun-lit wavelets. We think this definition fallsunder-action certainly leads to spathly and torpor-ever-action to all the various grades of painful mental states; yet, the essence of this mental pain is surely not over-artice, but pent-up activity. Meand pain waries in degree from mild indefinite gloom up to extremes of auguish and despair, in which restricted volition is replaced by agitated and frenzied movement. Now, numediately the sphere of object-countries. asse declines in functional activity, the some quantity of the one uphere becomes the pine quantity of the other; which, in physiological terms, implies that ingoing nervous currents which normally would are use agreepriate reactions in the intellectual and motor realiss, become diffused in the realms of feeling and emotion; what is lost for perception is gained in feeling. The sentricted accumulation of energy is surely at the basis of states of moutal pain. If we allode to such states so the result of under-action, the under-action is distingily that of the higher planes, whilst there is a consumuling syphis of ectivity aroused in the subsedinate planes of feeling and sension. The socalled states of over-action, again, are nonline conditions more definitely expressed—the overaction being that of the recipions, afferent, or imprentive sphere, with a corresponding underaction of the afferent. intellectual, and expressive sphere-in fact, all grades of mental pain are dependent upon over-action on the impressive and restricted activity on the expressive plane.

In normal states, ingoing currents, or impressions centrally initiated, are translated into realms of motor activity or high intellectual planes; in states of mental pain, such translation is restricted, and such activities expend their energy in those diffused spreading discharges which are the correlatives of emotional conditions.

We find pleasurable states invariably associated with the translation of feeling into thought and oction: we likewise find pointed mental

states associated with the surging tide of feeling valuely struggling to burst the barriers, in order that it may appear under the varied forms of intellectual or muscular activities: yet, we find all degrees of the latter—from that of high-strung amotional potentiality, down to those minor states where feeling is expressed in terms of general gloom or irritable impatience and fretfulness—passing, in fact, towards states where feeling as a higher emotional state seems well-nigh abolished, and passive indifference and spathy indicate a purely reposite state of mind. These latter cannot be comprised under the head of states of mental pain, however consistently they may be classed as states of mental depression or exercise.

The Reaction-Time in Melancholia.—Any estimate of the reaction-time in health or disease must take account of many possible sources of error; and such fallacies are but intensified when dealing with the insane mind. A large proportion of the insane do not, of course, admit of such methods of examination; and even amongst such as cheerfully respond to experimentation, a certain proportion are likely to falsify results from individual peculiarities, and the unproficable vagaries of the insane; delusional cases are in this connection the most doubtful subjects. Where the reductions involve much impairment of memory, or profound mental torpor, the test of reaction-time, however taken, is perfectly fattle and unreliable; and it is only in those instances of isolpical second decognises, where the intellectual operations are not grounly involved, that a failure in the energy of cerebral rolles can be regarded as of important significance.

In applying the test, the patient should, so far as possible, be made to take an interest in the experiment, and this can frequently be done with great success, by a little tast, oven in serious cases of melancholic deprendict, or south establishments. Each subject should be repeatedly tested short of actual fatigue; and no average struck of the rapidity of reaction from less than seemly trials. In our own experiments with the image we have restricted ourselves to the estimation of the total time required for reaction to the stimulus of sound or light; and have not assempted to investigate the more complex reaction-time of a more involved process.

Reaction-Time Instrument.—We have employed an instrument made by the Cambridge Scientific Instrument Company and designed by Mr. Galten, and have found it admirably adapted for our purpose in testing the reactions in the insure. A short description of this apparatus (fig. 18) may not be out of place here.*

^{*}See description of the apparatus by the norther or Mack Tulor's Dictionary of Psychological Medicine, vol. ii., Art. "Psychogicysteal Methods," So. 1, p. 1022.



Fig. 16 - Resiston Time Appointm.

The above represents the apparatus as unbequently modified for abbuning a professor reaction time. It will be noted that her graduated rode take the place of a supple rod that such rad to compended by an electro-congret to occur allest release, and that the six Persons cells (quart) supply the annual to marking the electro-signals, the upper series of imagents, and the electro-magnet for the clamp. The ampier term of apparatus—decord of the extra rode, buttery, and foot-board—was the instrument mainly used for the results given throughout this work.

A square standard of pitch pine, 5 feet 10 imbes to height, is fixed into a solid, unyielding triped, in which levelling serows some its exactly vertical position. Half way down this standard a rectangular piece of malagany or teak is screwed at right angles to its long axis, this supports a horizontal table upon which rests the hand of the party to be tested. To the same rectangular piece a small electro magnet is fixed, which holds in position (as an armstore) a spring stirrup so long as the electric circuit remains unbooker. This latter circuit passes over the table to a contact breaker, so that the finger of the operator, by depressing a button here, breaks the circuit, releases the attrup, which, being in its turn drawn back by a powerful spiral spring, clamps the registry rod in its fall. The stool base of the stirrup is litted inside with rubber, thus forming a more effective brake.

From the summit of the standard a box-or innewcood red is senpended, three feet in length, and accurately graduated along its edge in lumifredths of a second, up to thirty divisions, the limit of its complete registry being therefore three-tenths of a second. Astride the summit of the registry red rides a heavy brace plate which falls a short distance with the red, being then arrested by a disphragm, its impact causing the sound signal; or by the make and break of an electric current here it starts an electric bell as the sound signal. The registry red as it hangs ansymbold is concealed from the subject's view by a narrow projecting ledge of pine wood fitted to the standard betwint the red and the person to be tested. In this ledge, at a convonient height for the eye, is a small vertical slit or window, and a corresponding slit exists in the red through which the light is seen; but, on the release of the red, the window is closed by its fall, and a signit signal is thus affected.

This apparatus should be as simple as possible, solid and should by steady; the rod should hang perfectly vertical and should not come in contact with any surface in its fall; by arranging the levelling screws in the tripod the clamping of the rod should secure it from any sliding, and in its descent the rebound should be reduced to a minimum at the fact, and as little clatter as possible allowed. The release of the rod should be effected with absolute silence, and this is best secured by aspending it to a straight bar electro-magnet by a short cylinder of soft iron. The fall of the rod should be on a outlion or pad filled with sand to desden the resulting thad and check the rebound. The rod is released by pressing a button conveniently placed behind the standard out of observation, which breaks the circuit of the electro-magnet expending the red.

The Test.—The subject sits supporting his right hand on the table, his foreinger on the interrupting batton of the clamp magnet. The operator electly releases the rod which gives the sound signal, and the forefinger is instantly deperated, releasing the stirrup and clamping the red. The figure on the front of the red where clamped gives the reaction-time for the sound signal.

In the next place the brans weight is removed and the subject, sitting as before, is directed to keep his eye on the light seen through the slit in the rod. The rod is now released, the light disappears, and the subject, as before, clamps the rod as rapidly as possible. The time taken in the fall, as read-off on the edge of the graduated rod, gives the total reaction-time for a sight signal.

The general results, so far obtained, would indicate a decided probagation of the receive-time in many forms of insanity. Simple affective
forms—as in melancholic depression or maniscal excitement of a
simple nature—as well as invanity, the outcome of alcoholism, or of
epilepsy, and associated with general paralysis—were made the subjects
of enquiry. In none of these were the results more strikingly uniform
than in alcoholic forms of insanity, where, after eliminating every
probable source of fallacy, the reaction to an optic stimulus was almost
invariably delayed, and, in most instances, the reaction to the acoustic
stimulus was likewise involved. None of the patients tested suffered
from any serious degree of dementia, such as would have prevented
their fully entering into the interest of the trial.*

In general precipits, also, the same delay in reaction occurred, but for such cases we must refer the reader to the series of experiments as given in the section treating of these forms of derangement. Here we more particularly desire to record the results obtained from the antijects labouring under melancholic depression, simple or otherwise. In the following table we have contrasted the results obtained from a series of individuals presumed to be healthy, and from the subjects of more or less acute melancholic depression:—

RECORDS True or Brains and Donaer.

		Alms	etic Hinsins.	Optic Intended.
			Sec.	20%
Self.	-		13	016
R.H.			15	117
T. H.,			-16	153
N. Su.			13	-21
Tt. Act		4	16	21
E. W., Simple Melancholia,		-	-29	(3)
M. In n n .			-22	723
8 W., Chimacherie Meleucholes,			129	-23
J. W., Hyperhadriant u			12%	(24)
			-30	26
DI D		1	-14	94

[&]quot;Son also " Reaction time or certain Forms of Innacing," in Toke's Discourage by Psychological Medicine, not. u., also " Beaution-time" (in summ), by Prof. Jactrew, with Hibliography.

With the above we also contrast the results given in a table by you Kries and Asserbsch, embracing the investigations of several observers *:--

Souther.					Ann	des Statement	Optic Itimutas. Ser.
Birsch, .			-		-	0:149	0.500
Hirtely .					-	0.951	0.223
Donniera.			~	- 1	-	0/191	0.188
Von Wittish,						B-192	0.194
Wands,	-	4		- 1		9124	0.475
Exper	-4	-		-		0:136	0.150
Ametick,			-	-1		m102	0.001
Vin Kries, 1	4			-		W1000	0.993

It will be apparent from the observations on healthy subjects, that whereas from \(\frac{1}{2}\) to \(\frac{1}{2}\) of a second formed the limit of variability for occurric stimuli, and \(\frac{1}{2}\) to \(\frac{1}{2}\) for simul stimuli—in the insane, the former is only exceptionally below \(\frac{1}{2}\) and the latter rises from \(\frac{1}{2}\) to \(\frac{1}{2}\) of a second. In healthy states the reaction to visual stimuli is slower than to accustic impressions:—

There seems good reason to express that the reaction-time of sight is necessarily longer than that of hearing in touch, on account of the photo-chemical nature of the wave immediate stimulas. One observer (con Withich) has even gone as far as to conjecture that the speed of conduction in the optic nerve is less than that of the other nerves of sense; it is rather to be concluded, however, that the latest time of the errory end-appearates, and of the cerebral processes by which sensory impalies pass over note and/or impalies is different (Lode), †

The prolongation of the reaction-time in cases of intantity generally, would indicate a special impairment in the visual as contrasted with the auditory sphere: both are often involved; but the former often suffers to the exclusion of the latter, it being frequently observed that a subject who responds readily and normally to an acoustic stimulus, exhibits notable delay in the response to a visual stimulus.

There are many reasons for agreement with Professor Labl that the distinction in reaction-time for these two kinds of stimuli is due, not to a different rate of conduction, but to the different atent period of end- and centric-organs; and we may assume, with nearly as much certainty, that in the derauged states mot with in the finance, the protraction of reaction-time found is due, either to implication of the sensory and organ, or to the intra-central link whereby the sensory is transformed into the motor impulse; the former is probably illustrated by certain subjects of chronic alcoholism (—the latter in ordinary forms of affective insanity.

Degrees of Mental Depression.—Of the immunerable combinations of mental symptoms embraced under states of mental depression.

^{*} Archiv. J. Anat. v. Physiolog. Abth., 1877.

⁺ Elements of Physiological Psychology, p. 477.

² Pide taylog, under Alcoholic January,

certain forms persent themselves, having many features in common of sufficient distinctive value to constitute them arbitrary varieties for the purposes of systematic study; such so-called varieties, however, it must be understood, see by no means other than purely artificial or arbitrary divisions, which are nevertheless assuming for the orderly grouping before the mind's eye of what otherwise would form but a chaotic and confusing assemblage of facts.

It is thus we hear of a parely affective melancholia, in which the emotional or affective sphere is shiefly at fault; and of a delusional melancholia, is which the fatellectual or identional sphere suffers.

Whilst fully secondaing the utility of such grouping—whereby we keep in view the more sociable affective implication in the one case, and the more prominent intellectual perversion in the other—we must insist that the student is here likely to full into the serious error of regarding such arbitrary divisions as the negation of a principle which we regard as one of the greatest importance in our studies of insanity—via, the universality of implication which characterises mental disease.

By this universality of implication we do not mean that all mental faculties suffer alike in extent or degree—this would be obviously abund: but, that however prominent and obtrasive may be the implication of any special faculty—however limited at first eight may appear the derangement, further investigation shows that the mind is its topolity has suffered. The psychological espect of mental degreesion presented to the student in the foregoing remarks, will have prepared him for the recognition of this fact of the universal implication of the mental aphere in cases of murbid depression—as subject-consciousness rises in intensity, so he has learnt to appreciate the wane of object-consciousness. It matters not how mild the form of pathological depression—how slight the degree of mental pain—object-consciousness invariably presents this corresponding enfecthement: but this latter feature has to be carefully looked for, whilst the former is the obtrustive and prominent indication of the derangement.*

We do not here alludo to definite all perversions, but simply to those minor grades of failing representativeness which we have already traced in the sluggishmen and poverty of idention, its lessonest rigour, and the dubiety of mind respecting objective existences, which later on, columnates in delesions of suspection. When we consider how, in transient functional disturbances falling for short of pathological depression, we find a gloomy unotional tone associated so frequently with a morbid suspicion, bordering at times upon actual delusive states—inconsistent, irrational misjudgments of our fellow-men and

^{*}These considerations sufficiently institute the fallacies of implication to the student's mind of the term provide as contrasted with generalized immunity.

universal distrust, we may be fully prepared in states of pensine melancholis, however mild in type, to recognise in the sphere of the intellectual operations a corresponding wane.

Whilst minor degrees of pathological reduction result in a welling-up of feeling as the more obtained feature (simple melancholia)—degree reductions, resulting in more serious implication of representative operations, home in delactic persecutions (deinstonal melancholia) as the more striking feature, whilst the emissional glocom in its place, saids in the creation of further delactical nations as "attempts at explanation," to use Griesinger's phonocology.

If will at each be apparent low this view differs from that which exercisites, at its leading distrine, an affective region for massity one new view being that the relations' and the restinal elements of surel must be conquestly implicated, and that the precently of implication partains to the relational.

Of the clinical groups arbitestily constituted, from amongst the unijects of mental depression, we may cite as the more important.—

- (a) Simple melanchelta.
- (b) Melancholia with definious, including the hypochondriscal form.
- (c) Melancholis agitans.
- (d) Melancholia atonita, or melancholy with stupor:

To these separate groups we must now devote some attention i in the first place, it is necessary to indicate, that the varied states which these terms compute are the outcome of the same mortial process in the cerebral cortex, and represent but different depths of dissolution—serial stays in the same disease.

A still lower stage of reduction is that of maniaml excitement | and we mention this fact here, since it is so frequently implied that mania and melancholia are shiring elicence, rather than different stages of the same morbid process.

(a) Simple Melancholia. —Under the torm of simple melancholia are embraced forms of a purely emetional or affective insanity, where there is mental pain or emotional distress apart from obvious intellectual disturbance—if such mental pain be abnormal in its intensity and disproportionate to any exciting cause, we have a species of simple mulancholis.

Here, at the cornet, we must qualify the places, "a parely continual or effective intunity;" for it requires but little insight and the operations of the sound used, to lead us to the resolution that so interfereded are all the mental ficulties in their methal composition, that as each division can be drawn, in a strictly artendicum, between the purely exectional and the intellectual states. When we quak of emotional states, we must ever bear in must that the form remotes ment to less of the intellectual element of mind—that every mental operation provippess in its very simplest form—bulling, memory, resoon, written; or rather that there are less different aspects of the same state. It is, therefore, only in the greater pre-

positivator of the one to the other factor that we distinguish between absormal model states.

Simple melancholia, therefore, really embraces those states of morbid depression in which the painful emotional element of mind preponderates to the exclusion of disorder of the more relational element; or, to be more exact, where the disordered feelings by their intensity and obtrustveness overshadow any slight intellectual disorder which may be present. Definite delusional states, therefore, are evidently exclused from our definition; reason still asserts herself; there is no sudeoblement of memory; volitional control is not withdrawn. The nerobral dissolutions which such states of melancholia imply tend certainly towards a lower level, towards more complete dissolutions—and the psychical expressions then vary with it to those of dissolutions—and the psychical expressions then vary with it to those of dissoluted reason, memory, and will; yet, for purposes of clinical study, it is convenient, although this tendency be obvious throughout the attack of insacity, to fix the mind's eve upon the affective disorder.

The subject may long have enruggled against the gradually increasing deprecion, and may have convenied his actual state from the notice of relatives or associates—any undue reticence, absence of natural buoyancy, or change in decreasour being usually explained away upon any other grounds than those of mental implication; and thus the barrier between simple functional disturbance and a genuine pathological process is passed without notice. A universal gloom-pervades his mind, and a distaste for all previous avocations and interests declares itself; exceeds and all forms of recreation no longer appeal to him, and a dail uniform level of indifference is engendered towards the causale world. Life has lost its freshmen—Nature presents him with no delights, and whatever there be of beauty or happiness or gasety around, but serves to emphasise his gloom as he feels their want of kinship to his nature. With still greater emphasis can be may with Nature's poet:

" But yet I know, where or I po.
That there both pure'd away a glory from the earth."

Retiring into the solitude of his own self-consciousness, he besteds abstractedly over his alien state—fully cognisant of the nature of his scalady; often dreading to reveal his condition to those most interested in his welfare.

But though the object-world has lost for him its pleasurable aspects, and thought and feeling with regard thereto are laboured, restricted, and wanting in vigour—yet subjective states of introspection, of self-analytic activity are keenly dominant, and this self-inflicted testure grows space as sleep is lost, as defective appetite and sedentary habits of life still further retard the processes of nutrition and repair, and usp the foundations of his mental vigour.

It is at this period that suicidal promptings often come to the front; but, here we see Reason unserting herself-the patient recognises his moral abligations clearly-often shrinks with horror from the suggestion-er may be driven to implore protection such as may be afforded by anylum supervision. Many, however, in the gentle forms of depression, are equally conscious of a degree of self-control which enables them to most any such suggestion with perfect confidence ; they may atter the must formula of being wearied of life, but, with the utmost self-assurance, deny that they could ever be induced to lay violent hands upon themselves. As we shall see later on, it is in much more serious autritional anomalies, that the helplessness of the viction and the dread of impulsive acts prevail, as in the foliminating psychoses. Every degree of mental pain may prevail in the subjects of simple melambolis, from such as do not materially interfere with their parasits-home or business duties, to such as result in other paralysis of volitional energy; and, in these cases, their daily wants have to be strictly attended to-as they would starve rather than usert themselves to eat.

It is by no means unusual at this stage of depression for homicidal sations to replace the suicidal deed. From motives of intense love for her offspring—to save them from the terrible calamity which appears to await herself—the mother will occasionally merifice her children or anyone nearest and dearest to her (Fickolom).*

If the jutient down not improve, a further mage is reached in which we observe a still greater wane in object-consciousness, the jaundiced view of the environment is no longer correctly interpreted as due to the subject's own indisposition, but doubts arise-distrust prevailsand a suspicious bearing towards those around inaugurates this further state of dissolution. The patient, not actually deluded, bugins to misinterpret all interference, however kindly means-looks surpiclously at his name-struggles violently at the most trivial attention paid him; whilst the preparations for feeding him or other necessary procedures may be uset with every right of terror. And get, in questioning him, he admits no definite deluded state-is readily reassured-only the next moment to relapse into his state of allprevailing fear that something may happen-he knows not wirst. The rolitional sustriction hore is serious-self-confidence is greatly enfectived, and suicide is not unusual - the stage is one of transition to the more definitely delused or acutely melanchelic forms. The following is a typical illustration of simple melancholic depression :-

M. A. W., aged sixty-three, a married woman with a family of two children, was windted suffering from an attack of depression, which had commenced about

^{*} See Dr. Nichelson's remarks at the discussion of Dr. Semalilgan's Art. on the "Innerity of Personation," Journ. of Montal Science, vol. xl., y. R6.

three weeks previously. She had an earthy examination—the shocks morried with diluted capillaries; her builty condition approached the oteon. No programmed earth-randa charge our apparent, although the heart's action was resewhat brokle; the grait-outliney system appeared leadily. It was stated that she had just attempted to drawn brestlf in a water built. For these works past she had slept but little; had become twee depressed from they to day. From her friends' stalement, it appeared that the half-bell a perfectly steady, temperate like; half never before exhibited any mental disturbance or coordinately, and was not known to have had instant or amendic ascentors. She was extremely depressed, wept. constantly, was relacted to cater into particulars about her mental state. She admitted that she had been falling in health for some months prior to her attack, and that she did not know the cause of her boddy or mortal mineral --- ald not explain why she was distressed, but was constantly the subject of vague four, and frequently asked what was to become if her. No delumins users apparent : she had suffered from no half-minations. This condition continued for some three weks: de always prounted a most melandodic expression, but slept well at night without solutions, and only on one occasion required for elde administration of food. Through the day size sat embing bernelf to and tree solding aloud, and st times became greatly agitated. The more arute symptoms then enhanted, and she turned her attention to household work. The tocame more reticent, and when proved with questions give mismable and wept hitterly; rould still give no explanation for her feeting. In less than a result size fully realized her own imperrement in health-grew men Augeful, less retirent, but now troubled harself much at having attempted existle. She was now given small shows of option and other (15 and 30 minims respectively) twice daily, and in a few works later was closeful, notice, inferitions, larging to return to her friends and home, and leftthe are best some test weeks after his admissions.

(b) Delusional Melancholia. - This form, as before stated, we regard as presenting us with a deeper stage of reduction than that of the simple form of affective insunity (simple metancholia). Giveny apprelention and suspicion have here passed into definite and persintent delusional states; and, intense as may be the emotional implication, the intellectual darangement now appeals more forcibly to us : and, being constantly instated upon by the patient, is upt to be regarded by the friends as the real court of the maledy. It would be quite apart from our purpose here, even if it were practicable, to illumrate the various features assumed by three cases of delusional fasteric layeves off at epiton traisfiles eviews flire redr-and-and-an forms of instairty which we shall deal with later on. The perversions of the intellect may apple to any one of the whole range of things outside the subject, or may be emirely restricted to the bodily and organic semulions; or again, to his relationships to another state of existence—to his moral being. An infinity of delastre sotions, thesefore, necessarily presents itself, often in such strange and contrasting combinations us to be atterly anclassifiable.

Prominent, however, amongst such definive notions are those which shoul with the adoject's corpored frame—the head, the body, binds, or viscers—often of a grim, and as often of a grotesque character, and

which, if the attention be rivered thereupon, constitute the so-called hypochondriacal melancholia. Then again, we meet with delusious relative to the moral being-the victim has committed the uspardonable sin, or for some, perhaps, insignificant action, his need is entirely last-or passages in Scripture constantly recur to him of a gloomy demunciatory nature in applicable to his own state, forming one of the class of so-called religious melancholia. Or again, the encroachment of the environment is the more perceptible feature-and the mind conjures up those unligh agencies therein. which are expressed in the multitudinous ideas of persecution, tyranny, treachery. And yet again, a well-marked class of patients infer demoniacal possession, witchcraft or other unseen agency. as accounting for their states of mental perturbation. In these conditions of delimiousl melancholis, hallocinations are not only frequent, but often form the chief material out of which such dolusional states are framed. Aural hallocinations more frequently occur than visual, and both far more generally than affectious of smell or taste. Hallacinations of small are of eminous import—they are frequently associations of irreparable alcoholic brain disease of epileptic states of transactic forms of brain disease, &c. In the following case, however, we find such hallucinations of smell in scote insanity induced by alcohol, but rapidly represend from :-

M. A. S., a married women, aged furty-eight, sufering from her first attack of instairty, stated to have been of ten days' duration. She had lived an immoral life for twolve yours past, and lately had been of intemperate habits, drinking heredly up to the owner of her attack of ensembly. She is not known to have inherited intentity. She was of computer group example, her complexion thickly, and expension dissipated; her holdly health had not very materially enforced. On admission the was greatly agrazed and correled, whiking for limbs exclosing in both or trying to push from the room. She deep for a few hours after taking 30 minutes of parallelyds. Much metacologic agriculture continued seed days the strugged redently to open the down, declaring "there was a charm to upon them." The following region in hours' shop around upon the administration of 25 grains of chlorals she at take only and orderly.

At this period the was composed, attentive, and coherent, but betrayed the presence of numerous feducies and resent annot half-matrices: thought she was in an arythm: come here for pretection from the noise in her own house. There was such shorting and calling: if the did not conserv, they yet backer and femile. Voices heps calling, "Mrs. Brickett, Mrs. Smith, Mrs. Brickett, Mrs. Smith, come and help me, come and help me cert!" when she saked, "Who has put you there?" they shoulded "Buston, Buston, Ruston; "that had been the cry in her house for the last two years. (She had gove to the police for protection against a sum she called Rautas, and had enoted that the then me his body bloom up by dynamics.) She had "most un certify well like that of a door body in her house for the point few weeks." When she went to the police for protection, "hundreds of black-gaugele followed obserting after her." She went the sums day to get water from a tag in

the yard. "She was sure it was dragged, it dried up her mouth, which began burning and swelling; she mut confident somebody wanted to stab lier." As north in such cases, she absolutely republished any suggestion of intemperate habits.

Her columns of demonstrate continued, but the required a solution cach night to secure any sleep. A week later sits ufficted that at home she continuity bound a value from bounds is store table railing cet, "O Mrs. Roston, Mrs. Roston, O Mrs. Birkett, O Amy, come down here; The down here make the store," She next and scarried under the store, and saw what "would have blown her up if she had remained in the house," None of these voices have been bound since rewing to the negligit.

A terraight after her adminion she exhibited but very gratte depression, shifter the first time began to question the real or imaginary nature of the voices heard. No release account, and is less than two mouths from adminion she left, perfectly reserved.

(a) Hypochondriacal Melancholia,—In this form of detunional insanity, the morbid interest of the patient is concentrated upon his bedily organism and its functions. In healthy states of artivity the ingoing currents are use, as we have seen (p. 160), none but the massive feeling of pleasurable self-being, and it is only when the bodily functions are deranged that we become directly conscious of the existence of our organs. So interblended, so inextrically interworse, is the web of scarnous feeling produced by such activities, that out of it areas the outself one of the personality—the eye; around the latter there erowd the impressions received from objective existences—the physical in contradictination to the physiological environment; yet, these two balves are dissevered, and although they help to form the aggregate mind of the individual, the characteristic starcy of braithful mental operations consists in the continuous and vivid realisation of this distinction between the subject and the object world.

In the lower forms of life, we conserve of the subjective element as beening by his the larger factor of mental states—a wast series of improvious received from the physical contrament we not referred thereto; and, although the appropriate marries may cover, this by increases proves that each semation are not referred to some part of the argument physical surreconnect. The higher we can, the more definite becomes the reference of its own series of excitations to the object-world; and this, in certain special lines, we see to a remarkable degree in certain inserts, such as been and some. By man, of course, we attain the complete severance between these artificial before which empleys possible his knowledge of misers as enhanced in the rarious sciences.

We have seen how the failure of the one half (object-consciousness) may proceed to a serious extent without implicating the groundwork of our being—the personality; and states of advanced obscaria realise this stall some failt; we may equally well conceive how the other half (subject-consciousness) may suffer disruption, if this "sensuous core" of the personality be implicated either by peripheral or centric derangements. That the former is possible, we have confirmed by numerous instances of hypochendriasis with mental derangement,

arising from disease of the abdominal and thoracir viscera; that the latter occurs, is sufficiently obvious in the excitation of similar states by samus' agencies—the perusal of morbid and semunical books, obvecae pemphlets, and the association with similar cases of hypochemiciasis.

The anxieties and delusions of the hypochemiciscal patient may have reference to any part of his bodily organisation: amongst the issume, however, prominence is given to the tract innervated by the presumequatric nerve, and thus the regions of the throat, thorax, and abdomen—the respiratory, circulatory, and gastro-intentinal organs are peculiarly the subjects of the patient's anxious attention and complaint.

The hypochondriscal subjects of epileptic insanity almost invariably refer their nilmonts to the atemach and towels—obscure feelings, pains or imaginary diseases, torpidity or obstruction, are incommitly dwalt upon by them; and in most instances, if not all, have some basis in actual derangement; but it is in the constant broading over those states, and the enaggerated colouring of their ailments, that the hypochondriscal condition is revealed.

In the alcoholic subject, on the other hand, hypochondriscal notions have reference often to the peripheral unds of the nerves of common semantion: thus, they continuously examine their limbs, complain of pricklings and other strange semantions in the skin; assert that they are poisoned, so that the skin is black, diseased, or "corrupted" (see Alcoholic Insensity).

To take the more frequent ailments complained of in hypochondrized melancholia, there is the idea so frequently leading to obstinate refusal of food, that "the throat is made up," or that the gullet is wanting, an idea which persists in spite of the frequent passage of the ferding tube. In such cases, a spasmodic stricture of the oscoplague is not infrequently met with as an obstruction in feeding-the spann in always high up; it is a reflex spastic state intensified at once by the introduction of the coophageal tube. Although met with in men, it is of more frequent occurrence in women, and then often associated with functional attering disturbances, as in the couplinguous of hystorical subjects. Organic stricture we have very rarely met with in such subjects; but direct compression from enterged thyroid we have frequently found, associated with such delexive conceptions of the absence or total occlusion of the gallet. Such patients are intensity dejected, often seen with the head tent forward, the hands grasping the throat, and fully persuaded that they are dying of immittion, whilst fed artificially with ample meals. They will point to their fimbs (often well sourished) as evidence of their advanced enaciation; and they will often induce vomiting, by irritating the fances after feeding, declaring that the food so introduced can do them no good.

In like manner, other subjects declare that they have no stomach, and transform various dyspeptic symptoms into indications of grave manner; they may on those grounds recent my attempt at feeding, and struggle violently to theser one's efforts. Others may take food locartily, yet declare it then not sourish these, and that they are slowly undergoing starvation.

Observation of the bowels is a most frequent idea, aperient medicine is mixed for repeatedly, and dispite the daily action of the bowels, the image patient reiterates his belief that my stool has been passed for days or weeks. Such patients are pictures of minery, importunate about their treatment, querulous, treitable, wholly absorbed in their news feelings, and can be induced to talk upon no subject without at once reverting to their minerable plight.

In other cases, the genital organs are the source of anxiety-the subject believes himself to be impotent or the subject of syphilis. and no possible argument can be used to assure him that his whole system is not permented by the virus. One sutient, at the West Riding Andum, believed his generative organs had been displaced: another that his sexual argain were disented and mortified. Numbness of the epigastrium was a sore grievance to another patient, who, interester, believed that his stomach contained pins and profiles. In the case of a middle-aged man who died of tubercular pithisis, an accident (from which he had really suffered some years since, and in which he fractured an arm and two ribs) was made the basis of extravagant delesional notions. He insisted that his skull was nearly hollow-"half his brains having been acattered about at the time;" that he also lost "two gallons of blood;" and that a serew placed in his bowels by some unknown agency caused him continual and terrible agony. The strangest combinations of delusional notions arise out of the agent trivial disturbances of function-slight constitution, fatulence, hoursburn, eractations, mild intestinal estarrh are exaggerated to ludicrous proportions: the subject has a large animal within him grawing at his vitals, or is full of serpents; or his meat and drink are poisoned by vitrial; he is "full up incide;" or flames of fire consimally been within him. A mule patient who and at Wakefeld Asylum of the management induced by long continued refund of food and melanciolis, was wont to believe himself covered with a skin eruption from head to foot; he would also blow his nose foreithy to demonstrate how his brain was gradually pussing out av that channel.

Patients, again, will lie in led declaring their inability to rise because they have no budy or no legs: and one well-known character

at Wakefield, when asked her name, would always reply, "I have no name; I am no one; I have no body, no head, no limbs; Fis a voice; I'm an echo."

Burrows speaks of hypochondrians as never occurring before the age of twenty-five; * but approbasilizated melanthelia is by no neutral infrequent at patienty: in fact, we might well expect the omet of each a disturbance from what we know of the physiological cycle of events which occurs at this age (see Insently of Patients). "Hypochondrianal states are assestings observed in the years of childhood, and more frequently at the age of patienty. Then are extraordinarily frequent in young people, and more rare in advanced age." (Grieslager).

We notice in all forms of hypothendrianal melancholia, one feature wholls distinct from that characterising most forms of simple moutal depression, and that is the insatiable craving for sympathy in place of retirence and self-retirement. This tendency renders bypochoafirmal subjects the most unplemently egolstic, and the most redions of all cases of meanity; it induces them frequently to stoop to my depth of deseption, and to upe almost my condition so as to attract attention. It is in such instances that the hypothendrise so closely superaches the hysterical type, that it becomes a most point how to distinguish the one from the other. One of the most stelking instances of the kind which I have met with, was that of a corn; tabetic subject, in whom cerebral disturbance supervessed, and in whom this merbid verying for sympathy led to simulation of many symptoms, such as voluntarily induced eractations, retching, and exaggeration of his genuine taketic state, and then to the most mendacious and vindictive, set groundless attacks upon the attendants and medical officers.! In like resource, we find patients who will lie in bed, foecibly and continuously eractating, or obtrusively alsonming efforts at comiting to attract the attention of the pamer-by. In a case to be referred to later on, the patient atters load exclamations of distress as the medical officer approaches; or induces startings of his limbs, which he refers to electric shocks passing through his frame; or makes hideous grimsees, if he thinks he is observed, rolling his eyeballa about as if in torture. In another instance of hypochondrissis, a female endeavoured, for months together, to attract notice by load belching rouses, but found a more ready means of communiting attention by picking, scratching, and defacing her forehead and cheeks with her mile, presenting a most piteous aspect a sourcely had she recovered ere she recommenced the same practice, and only appeared satisfied by the sympathy it evoked. It is in this cracing for sympathy

^{*} Commenteres, p. 160. 10, cir., p. 217.

² The case was one of interest throughout, and has been fully detailed by my colleague, Dr. F. St. John Bullon, Bruch, part al., April, 1888.

and self-reference that genuine hypochendrianal insanity differs from the hypochendrianal stage of delusional insanity—i.s., of the programive systematised insanities; in the latter, as we shall see later on, the reference of the subject is invariably to the environment; the cause of all his misery is outside, and in lieu of the craving for sympathy, a bostile feeling is rapidly engandered.

Occasionally, the morbid epigastric semations induce unnatural cravings, as is the case with hysteric ambjects; we have known the case of a female hypochondriac advanced in years, who, in this state, cleared away gradually a square pard or more of plaster from a wall by continuously swallowing small fragments, ere the cause of the disappearance of the plaster was detected. This same patient subsequently took to pulling out the hair of her head and swallowing it; by this means, she had become on two occasions completely hald over the scalp; ere also died, she manifested the still more revolting habit of devouring excrement. Yet, this woman even declared she had so feely, and would mean piteously for hours at her forlors condition.

Another aged hypochendriac would reatleady pace the ecoms and corridors of the saylum day by day, bleating like a goat in distressful tones, a picture of abject minery. He had been fed for months together twice daily, but his exeming meal, purposely concealed on a semilery shelf by the attendant who had discovered his weakness, he would always necure and drink surreptitiously; yet he could never be induced to take his other meals by a similar stratagem. In these cases of chronic hypochendriscal melancholis in advanced age, dementis progressively advances and no recovery is to be anticipated.

Swieldal tradescies are presumed by the friends to exist in all cases of hyperbondrianal meisocholis, and we frequently hear of attempts at strengling, hanging, drowning, or other measures in which we may fairly conclude that a fone offer micids was not the patient's object, but rather a morbid wish to attend attempts within the walls of an anylum. Occasionally, however, as the outcome of alcoholic intemperance, we next with a form of melancholic hypochondrianis, which, once recognized, will not again be readily overlooked; it is one of hypochondrianal debasions associated with extreme enfectionents of the will, and deeperate impulsive conduct is its invariable accompaniment (J. F., J. S.). Such cases are highly neurotic by borthage.

(d) Melancholia Agitans.—We have referred to delurional forms of orelaseholis as a deeper reduction than the simple affective form; now such cases of delusional inamity frequently exhibit armse symptoms.—i.e., restlessness, increases movement, insufferable anguish, and

^{*} Acute in the sense of intensity, not of duratum.

overy indication of an agostical state of mind—these forms of acute melancholis are still deeper stages in reduction: they are in every sense an approach to the minimal reductions. By melascholis systems, we do not indicate this acuteness or intensity of mental pain, for the actual pain is often for more superficial in character than might at first sight be apparent: but we denote by this term the prevalence of a motor agitation, which, in like manner, approximates to the maniferal states. Such forms of melancholis may be of short, but usually are of prolonged duration, even lasting over several years; they may from but a stage in any mental disturbance, or may characterise the case throughout, to its termination in recovery, in dementia, or in death. Dr. Fleury recognises the intensity of snicolal proclivities, as well as the unforcurable programs of agitated melancholis occurring at the climacteric in women; he also draws attention to the frequent mesociation of such disturbance with drinking propensities.*

The putient is quiet only when selecy; rocks her body to and fro, or paces up and down the room increasetly; the hands are in constant movement, grasping the head, tearing the hair, rubbing the cleant, picking the skin until it bleeds, titing the nails, tearing or disarranging the clothing—or haddled in a corner, her face buried in her hands, are coays to and fro, lamenting her fate in lend sobbing or ejaculations sufficiently expressive of mental distress. Almost invariably the delusive ideas from which she suffers are prominent from the first—her soul is sternally last; she is cast out from God and the world; she is diagraced, or has brought roin upon herself and family.

Hallucinations do not appear to prevail in this form—they may have occurred as a prelude to this stage of reduction, and in their recall may constitute material for delunive ideas. The hypochondriacal forms which we have just studied may exhibit this state of motor agitation at different periods of its course. Let us take as one illustration of this form of mental depression the following case, where, after an onset of scate melancholic reductions and grave moral perversions, the patient passed into this chronic stage of melancholia agitans —

K. A. A., aged 32, and married. The medical certificate runs as follows—"Will not leave her bed, rocks herself about, mouning and repeating that she is downed to go to hell. Says she can see the fismen of hell before her eyes; that it is of no use esting or doing saything in the house, as she is bound to go to the had place." Her daughter states that patient got out of bed to strike her, and said: "I could tear you all to pieces: all my lares is turned to hatmed." Here, then, we have a case of acute mellancholia, atterly unfitted for from treatment instruced by halfacinisticus of the senses, and deliminus based thereupon: also by impulses to violence—"I could bear you all to pieces "; and grave moral pervensor, as undicated in her conferment to harred."

^{*** (}Chrical Notes on agricult Melancholis in Women," by Br. E. L. Fleury, Journ. of Mental Science, July, 1990, p. 348.

Them impoles, if explicited, would just an emility mass in a unicodal set. They infrince extreme instability of some times, and the explusion must come in some torus at massical, humicidal, or generally destructive conduct. The patient had a similar article of three months' duration, some termity years ago, occurring after labour. She has had considerable accusty massed her by a drunkers hardward, who his againstered all his means, and lost much property. If british of the patient harded limes(f.

The nonteness of the patient's symptoms rapidly subsided after admission, but she still remains the subject of continued malancholes agriction. She is most demonstrative in his conduct and observate in supressing her mental atherition. Her states of mental pain no imager well-up into explosive authors—in impulses towards with-destruction, do.; but, on the other hand, obtain continuous ruled in motor agriction and queralous complainings. There is no pent-up energy here is in the case H. T. it seeks and obtains relief in increment garriery.

There is here undoubtedly a frittering away of nerve-force from illconditioned cortical areas; but there is a vast distinction between such states and the genulus agony of mind apparent in acute melancholis. In the former, one is more struck by the continuous self-analysis, incessant introspection, and the faccination which the revelation of such states to others seems to possess for such patients; by the voracious appetite exhibited, and the maintenance of good bodily health, despite all this apparent distress. This accounts, in fact, for the eleconicity of the case; for nearly four years this metancholic agitation has been maintained, and so far from exhaustion ensuing, the patient is wellnourished and robust. In fact, the painful mental state is far less real than one is inclined to imagine—the symptoms falsify the actual state; her utterances are but formulae from frequent repetition.

We recall one patient, the subject of chronic mania, who would meet one every day with a lugularious expression, and the remark :— "I'm going to be hurns to-day—I'm going to be burnt: they are building a luge fire in the park, and they are going to reast me on it." When questioned, she would enter into minute details of a horrible crime which she inagined she had committed, in which she had poisoned fifteen children with corrosive aublimate: would describe how she decrived the methers: how she "watched the intile brata partake of the prisoned meal, and wriggle about in their agony." Then she would grin maliciously or shake with laughter, ending with her accustomed formula—"I'm going to be burnt to-day."

Such cases impress us with the superficial nature of what often looks at first like profound mental pain; we must remember the preciliar causing of the insane, who are always observant of the effect which they produce on the mind of the observer, their fordizes for ministry, extravagance, and distortion. STUPOR 179

STATES OF MENTAL STUPOR.

Contents Stuper and Dementia Etiology of Staparons States Stepar and Hypertiess-Staparone Melancholia Acute Frimary Dementia

By states of stuper we understand a suspension more or less complets of the continual, intellectual, and volitional operations—a suspension in contra-distinction to an abolition of these faculties: the letter condition we denominate "dementia," a term which denotes the absence of certain mental faculties, through impairment or destruction of the mechanism whereby such operations are rendered possible. Whatover be the change whereby these faculties are suspended, whether as the result of pensure on the nerve-elements, the physical correlatives; or the result of the inhibitory effects of powerful sensorial stimuli; or temperary circulatory changes through vano-motor influence; or exhaustive centric nervous discharges—the distinguishing feature is that of an arrest, transient or more enduring, of the intellectual operations, which may be suddenly re-initiated under an altered state of things.

As in cases of domentia, the abolition or impairment of these faculties has often notable accompaniments extending over a wide range of the corebro-spinal operations, in impairment of semation, biunting of the emotions, enfeeblement of volitional activities—so, in states of stupor, a similar impairment of the semont-motor functions is apparent. These are the accompaniments, but the intrinsic nature of stupor depends upon the arrest of ideation and suspension of the intellectual operations.

The innane present us with every grade of these states of stupor, from cases of mild aparty, to depths of profound and persistent lethargy, in which the subject closely simulates the aspect of genuine dementia.

Mind forms of staper offers find their parallel in normal physiological life, as in the confusion of ideas which our waking moments are consistently prime to exhibit, We know a medical friend, accretemed to along heavily, thus partially awakened by the night ball, receiving the message, dressing, and proceeding a receivinghic way upon his mission ere his destination and import of the visit were clear to his mind.

In these states, the perceptive faculties may correctly appealed external things, but not their relationships to ourselves, and a state of transient stupor energy. The state of post-epileptic stupor exhibited after a series of sovere fits is interesting in this connection, as presenting a similar mental chrubilation to that seen in the cases of insanity to which we now refer. The vacant gass, the dreamlike look cast around, sufficiently indicate the torper of the perceptive faculties; with the gradual re-instalement of the mental powers, semi-encouncious movements commence—familing of clothing, feeling or ruthing of the limbs, pulling about of furniture, incessent restlements, and ill equilated nervous discharges which salter in awakening consciousness. Such restless movements betoken the re-awakening mind, the re-energising

of discharged centres, and find no parallel in states of stuper where the dormant intellect is shown by aluggish motorial reaction, fixation, and immobility.

We frequently observe, both in epilepsy and general paralysis, instances of suddenly assumed stupor, often of long continuance and not necessarily preceded by any obstons suctor discharge or convulsions undoubselly, in these cases, there has been discharge of anetable grey matter from sensorial realms of the cortex.

Thus, a case of takes dornalis associated with mental symptoms has shown us this Seature; whilst a similar case of insanity in a taketic subject has, on the other hand, presented the post-convaluive stapes.

States of second stoper may be variously induced thus-

- (a) A mental shock, such as the sudden commettee samed by joyous or painful news in a high-strung sensitive subject, may have the effect of inducing such conditions of stup-faction; the acceptance of this fact is sufficiently attested to by such conventional phrases as "transfixed with horror;" "petrified by the scene;" "dumb with terror;" &c., &c.
- (6) Nervous discharges from tracts of unstable cortex, as in epilepsy and general paralysis, lead to mental stuper through exhaustion of the centres so discharged 1 much here depends as to whether the centres so discharged have few or many sensorial or psychical correlatives.
- (c) Other infloraces leading to exhaustive exponditure of forceexhaustive drains from the system—e.g., phthisis—the vicious habit of masterbation.
 - (a) Acute forms of insanity are prone to be followed by stuper.
- (e) Bromism, in like manner, whilst affecting the peripheral nerves, reducing the excito-motor functions of the spinal cord, and inducing torpor and sluggishness of secretions, leads to a loss of centric energy resulting in stuporose states; and other toxesnie have a like effect.

We must carefully distinguish these forms of stupor from the stapidity induced through obstruction of the nasal passages described an approxima muscle by Gay; adenced growths will here cause such abstruction to the lymph flow from the cranium as to induce much heaviness and stupidity, a vacant expression, a wandering gare, a thick pronunciation, an open mouth from imperfect respiration, and dulness of hearing (Fictor Lange).* The ressoval of such growths often leads to a rapid and murrellous change in the mental life.

Cases of stuporous invasity may be studied with advantage in connection with those exceedingly interesting conditions of hypnotism, which the researches of Mr. Braid, Dr. Carpenter, and more recently Heidenheim, Charcot, and Richer have revealed to us; and which now assume a more intelligible form as the phenomena become investi-

^{*} CentralNax für Norrenheilbunds, Mars, 1883.

gated by strict attentific methods. It appears that, in these artificiallyinduced states, every conceivable degree of suspension of the higher cerebral functions may be obtained, and the subject may pass from those light forms of induced reverie ("biological states"), through someombulistic and cataloptic phases, into the more profound stage of mental letharpy.

The nerves of cutsuscus sensibility, the nerves of special sense, the sympathetic centres in the modulla, may each be stimulated—the two former into a greatly emitted state of sensitiveness. The intellect may remain sente, but only on that train of thought for the time dominant: or the senses may, one or more, undergo notable blunting, and the reverse and state of expectant attention pass into dreaminess or profound sleep. Again, the muscular sense may be much exalted—automation of an elaborate nature may prevail, reflex movements occur on suggestion, or tenir spasss ensus from excitation of muscles and tendons.*

Now, the states of mental stupor which prevail in the insune exhibit features which at times strongly suggest allied conditions of the cerebrum to those found in the "biologised" and "hypnotic" subject. In them, the suspension of the mental faculties and implication of sensation vary much in degree; may be suddenly included and as suddenly referred; in them, also, dominant ideas appear to prevail and sataleptiform states may be assumed, or still more profound torpor take the place of a half-dreamy state of consciousness. In them, also, the binating of general and special sensation may be observed—analysis, loss of taste, of appreciation of temperature, of sight, hearing, or of smell, noted in hypnotic subjects (Lossleir), I and in those conditions which pre-eminently favour what are known to be predisposing causes of hypnotic ans transcolike states.

Mild stimulation of a special sensory tract, to the exclusion of others, notably of the triplicial, optic, and acceptic, as by the "passes" of the measurest, or the firstion of the eye on a tright spot above and near the eye to induce effort by convergence, or by soothing monoteneous sensist—will, in many subjects, induce the hypocoised state. So, states of mental abstraction, where a monotonous impressions or idea is the sole subject of thought, and where other impressions are voluntarily excluded, are conditions which pre-eminently favour states of induced hypnotism and stupor. It will be of interest to mention

^{*} The curliest symptoms of hypnotism appear as the result of simulation of the model of the coalse-motor tract in the modelle; there is spann of accommodation, restricted accommodative range, the p.r. approaches the p.p.: then standards of the appearance occurs with couplibelesses, widering of palpebral finance, dilutation of papil, quickened pulse and breathing.

^{*} Landots and Stirling's Physiciage, vol. i., p. 289.

here certain prevailing features in the state of stupor and hypnotism, so as to indicate more clearly any physiological or psychological relationship existing amongst such groups of symptoms.

Mental stopor approximates more closely to the cataleptifiers type of hypnotism, rather than to the truly cataleptic type. The unipert is not, as in the latter state, accessible through the special or general senses, and suggestion through these channels falls to elicit responsive movements; but, on the other hand, it does appear that the mind is often the subject of dominant ideas imposed through external agency, and that the sataleptifiers positions which the body and limbs may be made to assume, can be plansibly explained on the principle of suggestion through the suscessor sense.

Yet, the patient in these states of stepor is not asleep, nor does massage or kneeding resolve the rigid muscles which have assumed the cataloptic state. Herein, then, we see how the subject approximates to, and how far he differs from the hypnotised individual. It must be added, that these clinical forms are by no means grouped together as suggestive of identical pathological states—the pathogenesis may be wholly distinct for each class.

The firstion of the limbs in artificially-imposed postures, would seem to indicate a dominant notion of the necessity for preserving such a posture, illustrating the obedience induced to external agencies whereby the will is subjugated—the subject's attention being reached principally through his muscular sense.

The greater depth of reduction in these states of stopes is attented by the fact, that suggestions by command fail to elicit such trains of ideas and resulting movements as the hypnotised will present. Closing the fats and advancing the arms of a hypnotised individual, and placing him in an attitude of defeurs, will often bring about fighting movements in reality (Corporary); and suscepar posturing will elicit the associated mental states of which it is normally the expression. This, of course, does not occur in cases of genuins stepor, or the more profound reductions of "acute dementia."

We see, again, simple forms of hypnetism in which the sole muscular anomaly comists in an inability to open the cyclide or the mouth; parallel states of mental stupor present themselves in which the same features prevail.

Iff. K. L., aged twenty me, a passivel werner, with two shildren; the presence, an indust, aged mine weeks, was wasted upon the subtreak of montal symptoms are weeks age. No history of inflented imassive, neurosce, drink, or other vice. The latent had been material in all particulates. On adminion, she had a very viceous expression. "stared round the room in a waster manner: was wholly institution to what was said, and very mindy spake. When questioned the usually remained silent, even though the query was repeated many times, and effects were made to room bur attention; or she repeated the concluding words

of the question, or the words which the based uttered by a neighbouring patient."

She was emanated and ameraic; her pupils widely diluted. The therein and abdominal viscous remaind to evidence of domain to physical explication: but the bounds were torquit, and the barges was find and thickly noted.

After the operation of a colline aperiors, patient was ordered a mintage containing 10 grs. of aramonio-citrate of tree, and 5 minims of liquor strychole in each then this ship.

The occultion was one of panelsi stapor: the expression was malancholic and timerous, or one of complete stapor, in which the stood gening vacantily into space: the was silest, but meanimally would give interacte to meanifishic replies. Her liabits were frequently negligies. She required feeding by hand, but was induced in this way to take abundantly. Her hands were cold and somewhat livid: all her movements were very staggists.

About a week later, also became one day unklimly and violently encodeenclaimed about. "Cut my throat and let us die." Asked why she wished to die, she replied, "Became I am so shicked." Then she relapsed into her torsee abstracted, affect state, requiring continuous situation on account of less rest because at night, her dirty inhits, and her inattention to food.

A counts after for admission has builty condition had considerably improved the slept better, but was still depresend and is a state of semi-staper; the percentual Spectime were in acrost.

Slow improvement took place in her boddy health, but amendeshas persisted for some six morths, during which period the name treatment, alternated with true and above, was maintained. She remained singuish in her merements and amounted depressed in spirits, but would finely corrects about his citize of health, and was recutablly discharged as policied to the size of her hisband.

In such a case as the foregoing, we see the distinction between simple melancholic depression and the more acute depression of the associated with stuporous states: whereas the gentle depression of the former induces apathy, disinclination for exertion, beddly or mental, and becoding silence, the latter may revuit in one of two conditions—either in the demonstrative expression of these painful states (melancholis opiness); or in a spell-bound stupor in which the organism seems, so to speak, petrified by its intensely painful mental state—the melancholy with stoppy or the empirital of French alienate.

Such patients are often completely durch—their whole aspect that of intense stupidity; but, if you closely examine their features, you will observe evidence of painful cauction, or laterare anxiety, of inexpressible grief, or perhaps a look of extreme bewilderment or concentrated autonishment.

Numerous patients, who have suffered from melancholy with stuper, have, upon recovery, recorded full details of their mental state: they are generally labouring under some frightful delasion, which utterly aways their consciousness and will: the testside-world may be a blank to them, and their whole mental life is subject to this all-absorbing delasion. Perhaps they imagine they have committed assect terminared resulted or that the end of all things is at hand, whatever is be, the attitude, facial expression, and demeansur indicate complete.

subjection to the engrossing delusion. This concentration of the mind upon one painful idea, which aways like an autocrat the whole organism, has been figuratively allored to as a "crystallized delusion"—body and mind are crystallized around one morbid idea. Such patients often resist powerfully any attempts at feeding or other interference, and the refusal of food is sometimes most persistent.

Then come sudden, fiftil gleams of mind at times; a rapid, hurried unterance, with as sudden a relapse into silence and self-absorption; or a sudden, mad attempt at self-destruction—an impulse, the direct result of the painful mental state. One should ever bear in mind this suicidal tendency in attoposons melancholia; it is a common danger to be feared, and all the more since the apparent stupor is more that of bodily activity, and one is apt to forget that the mental state is often one of intensity muit and painful strain, must liable to explosive acts and impulses towards cell inflicted violence: all such suicidal attempts in this discesse are frantic and determined in the extreme.

The following is an instance of permanent mental enfeeblement resulting from stuperose melancholus of long standing —

H. T., short of stature, slight in build, and thus, was admitted at the age of twenty-six. She is a married scenar, of steady, temperate, industries halos, and was suffering from her first attack of manifest excitoment, the usest of which occurred a week age. No predisposing or exciting cause outld be assertained for her attack.

Shirtly after administrative tecause visitesity control, and apparently in great terms and suspecies of all around. After a short reminion of this excited stage, she became depressed, apathetic, and torque in appearance. She would stand or aif in one position for hours, guing racoutly before her-nor oveld she in any way be possed from this abstracted state. The estaments have not appeared since her administra. Ten weeks after administra, her minial condition had so far improved as to permit of her attending Church service and miletaneous; her bodily health also was considerably better. Shortly after this at is noted to Sho is in a state of probund reverse-mental state apparently use of public tension: fixed as though petrified to the soul or floor, her gaze is one indicative of intense selfabstraction and the provalence of some debusional idea which dominates has whole life, and which now frequently muora, without any warning, in entities, impulsive, and must francic attempts at suff electrostics, by throwing berself reclerify on the floor, or dashing her head against the suil. She would then lapse into a cata-Septic state, in which her limbs might be made to usuate say position for a lengthened period-her aspect transcribts, her expression indicative of interesand painful mental concentration; no vacuity, nor any appearance suggestive of drametic. Five positive after administra, the painful mental state had subsided, but there was asuch stupor, with however, occasional glosms of intelligencetransient prospettion of her surroundings. She sould not be induced to employ hersell; was local ass morning in a fixed attitude in the centre of the lampley wash lower, and on being questioned, and the was "at the Midfaul Station awaring the down train." She was very pule and assemic -there was an encurbed, She now takes iron and arsenie in mixture : subsequently altered to iron and alore. On June 6, 1883 -She carnot be persuaded to employ herself; will at times

assumes fautastic, rigid, estaloptic postures, but is not now violent to herselfapassocial catherets of temper occur, when she is aggressive and destructive. Her expression now indicates a full appromition of all that occurs around her, and judging from it, an absence of mental pairs. Item with canthurides and guaincumstrated to day.

Just 11: - The estamenta have now appeared.

July 12 - A Faradaic current applied to the head dudy for the to might mission-

July 31.—No benefit has comited from Faradaism: to day a constant current, from six to eight (Guiffe's) cells, was substituted, use electrode to furchead, the other to occupat, the direction of the succent changed by summatator inversal times, during five or eight minutes daily.

August 4.—Somewhat brighter in mind, cleaner in her habits, still idle: shows signs of indocency—expening herself, and on being reproved threatens to slep the officer in the face. There is wide dilutation of the pupils; rataleptifures positions are still terrored, and long retained.

Anyust 9.—Continued improvement: canaments have occurred naturally again; has commenced employing herself at nooflowerk; galvanism still continued.

Getober 11.—Constant current discontinued to day: her attacks of amplitive violence and excitement, as also her samileptic states, occur frequently. No improvement cocurred indeequent to that above moted, and in June, 1984, it is recorded that she still has a fixed contain look, is undoubtedly deladed, ending, and dangerous. The case then assumed the character of ordinary chronic missus.

Acute Dementia.—We have stated above that the extremes of stoporose states represent such profound letharpy as closely to simulate the aspect of genuine dementia: in fact, stoporose melanchelia passes, by almost imperceptible gradations, into unsquirecal dementia, and in several instances, we observed the melancholic stopor which characterised the const of an attack pass into typical dementia.

In other instances, however, the reductions are from the orast acprofound that a primary dementia occurs quite auddenly, and this represents the condition usually known as typical acute dementia. Acute primary dementia has been by some confounded with the stuporous form of melanoholis—submedolis are supeur: by others, with simple stupor, i.e., supposite of the intellectual operations apart from melanoholic states, and not one of actual adolition of function.

Undoubtedly, however, there is a genuine soute descentia, in which the patient recovers to a certain extent, but invariably exhibits much impairment of his mental faculties over afterwards. It is, of course, not suggested that the profound torpor, amounting in these cases to the appearance of utter fatuity, represents the degree of actual

^{*}In commence with stoperous states. Dr. Whitwell has communicated certain charrentions which appear to have an important bearing upon the pathology of some, at least, of these instances of stope. Careful measurement of the bloodvessels at the base, by the graduated cone, leads him to infer the presence of a congenital narrowing of their busins, associated also with a universal cardiovancular enfectionment. Dr. Whitwell's observations appeared in crimes in the Journal of Mescal Science.

dementia, i.e., of destruction of function: much of this is truly due to simple, though profound stupor—we can only judge of the amount of actual destruction of function upon the patient's so-called recovery. We find that this statement applies to all forms of dementia: all alike are liable to a certain admixture of stuporese states, which appear to emphasise the degree of abelition of mind—but which, dissipated by rousing the patient, indicate to us no auch prefeundly inactive condition as we should at first eight be inclined to predicate. In severe cases of acute dementia no such rousing can be induced, and upon restoration to more active function, the mind of the subject still fails to recall much (if anything at all) that has taken place throughout the attack.

The following is an interesting case of this primary descents, occurring in a young girl at the West Riding Asylum:-

As J., who is now isomity-two years of age, was admitted never years ago in a state of partial stapes. She had been regarded as indeedle from birth. Had never been able to read or write; although troublesome, she had not proved victors, dangerous to others or hurself, or of destructive habits. Had not suffered from emission. Her family history was free from murally, apoplexy, epiloper, and phthosis. Patient had never injured her head. Quite recently it was recorded that she had become allost, glormy, staped, standing allost staring variantly before her p her habits were degraded-required compalsory feeding. At times it was recorded that she appeared in terror, and behaved as though she are and heard imaginary objects about her. Upon admission there was much stupes; she remained perbrells made to all questions, and her conduct did not lead one to believe that also appreciated either spokes on pastominic language (a slight inarticulate cry alone escaped her. Facial conformation of low type-expression heavy, torpid. She showed a slight catalogue finity of the body and limbs at times : the limbs were cold and Maish. She was quite helploss, of dirty habits, and had to be clothed said fed.

The snapor rapidly passed off, and she was found to be a lively, good humaned girl, very children and imbecile, however, but able to speak in broken interances. Became active, industrious, and clearly: she was somewhat buisterous and excitable in behaviour at times.

In August, 1882, it is noted .—She has become heavy, apathetic, apparently demonsted; is negligent in her habits, more speaks, and requires all her habits wants to be ministered to by others; she slavers at the mouth, extremities are cold and livid; catamenia have not occurred for six weeks. Is led about readily and attention.

On the 11th of September she makingly spoke to some patients, calling them by mane, and remarked upon the beauty of some flowers must her. She then religiond into her former beauty, draway state, and so remarked until the that of Discerder, when she recovered her speech and moutal powers as makingly as they were semilied, and immediately began working in the wards. She was, however, flightly and workable, and on the 9th of this mouth it is noted that she "is extremely wavited and destruction, giving much trouble—is mischicrous, discretely, and violent"—for which attack she was treated by § gram down of hypocyamic, and also by bromish with Indian hours.

During the year 1883, also had repeated attacks of stupor which were share-

termed by their sudden must and rapid relief; but, in all cases alike, a stage of maniscal excitement followed apon the steper. In these attacks of steper she stands about in a storping attitude-matteriless unless led; does not resist; head droops, the face is expressionless, and saliva runs from the partially open mouth; the pepth are widely dilated, the arms hang helplowly, the hands and Seet are cold and livid. She has the aspect of one whose mental faculties are in complete abeyone. She remains where the is placed, and an voluntary intrespect. is initiated—mores a step or two when pushed, and there semains motioniess until again moved by others. She perso attempts to feed herself, nor does she resist the efforts made to feed her, but swallows the belas when introduced into her mouth the is wholly institutive to the state of bowels and bladder. The salesquant attack of excitement on petitive of partial consciousness was invariably of the same character-load, kilarious, boisteress mercenore, michierous prepositios, and possional visions conduct : the was also destructive of clothing, and wiffully destroyed glass and unaments. Upon the reinstatement of her furner mental brokh, the never could recall any experiences of her stage of stagor, although frequently questioned upon this point. The last attack of the kind occurred on the 15th of May, 1885, and her mental faculties did not clear up antil the 29th of November, a period of six months.

In such cases, we do not find the subject propose to swiden, wild outbursts of manifest or melancholic frenzy, such as we found prevailed in stuporous melancholis—to active and desperate attempts at solf-destruction, followed by as mobiles a layor into the stuporous state. The condition of mind is distinct in the two affections: in the one (the melancholic) it is strained and ever prope to explosive outbursts, in the other (the demented) too feeble to initiate any such attempt.

The maniami outbursts characterising the last case detailed, were really upon the road towards a restitution of the normal state of mental health: no the stuper lifts, so the maniacal reductions come to the front, are the subject is restored to her former self. And yet, not to her former solf, for a passage of her life, as we see, is completely abbiterated, and the mind is a blank to the events of each attack.

The apathetic passivity of such cases also contrasts strongly with the resistance, and often violent struggling, offered by the subject of melancholia cum stupoes. The blank, stupid, idiotic stare, and the niterly demented expension, are likewise very different from the aspect presented by the latter affection, where mental tension is very evident in the pained look, which sometimes is varied by gleams of transient costasy. Cataleptic fixation of the limbs is a frequent, but by no-means invariable, accompanious of scute demonstra.

Some subjects of this disease are, according to Dr. Blandford, in increment movement: "One girl used to man her jaws together for days at a time, and then changed to wagging her head from side to side." These are the less profound instances of reduction.

The heart is feeble, and there is great torpor of circulation—the hands and feet being cold and livid to an intense degree. Such patients are utterly negligent in their habits, they require feeding throughout the attack, and all their wants have to be attended to by others.

The following instance of acute dementia of three years' standing is a remarkable instance of the relief afforded by an acute pulmonary affection. The fact is well established, that certain acute mental allowants derive transient or even permanent benefit—at times attain complete recovery—from the incidence of an inflammatory implication of distant organs, or even upon the appearance of formsculi or curbuncle, or crysipelas of the head or face. The case in point presents a parallel instance.

W. S., agod neartest, a gardener—of strong nearetic miteratance, his fittier hiting had repeated attacks of innestig, and his brother being at percent as transfe of this asylum—one admitted on the 19th of June, 1885. Upon his admission he was much distressed; had stated on one occasion that he was to be bount; was midenity exceedingly timid, suspicious, and would be solving about, gazing before him with distressed expression, and obstinately reticent. He was a fairly sourished but—hair brown, under greenish, complexion from, both regular, but palate high-arched; the pupils were equally dilated and their reactions mornal; the tongue was protroded straight and steadily. The pulse was of fair strength, ninesy-six—the circulatory and respiratory systems normal. The trans amber-coloured, sp. gr. 1008, acid, thee from deposit, allowers, or engar.

On the 19th of the month, i.e., ten days after adminisors, he is ented as exhibiting a depressed and variet report—as very slow in all his movements, and unintraining an obstitute ellente. He becomes negligent is his hights, were his hed nightly. When asked to protrait his tempte, he does so i he look himself. He thus remained until the month of October, when the stuper became trees profound, and up to the present date, nectors must be absorpatedly, his condition has been anchanged. During the whole of this period be has presented a typical instance of mental stuper, the former melancholic phase having spite passed laway. He size is a diversity stooping attitude, the head forwards upon the close—the legs threat cut, and the arms hanging helphosph down. In whatever position his body or limbs are placed, so they remain: if the arms be extended above the head, they long remain to, and are gradually allowed to drop to his side. The whole high this gravitates downwards, the separate flexions of hand and forearm not covarring.

Now, in this case, if he be made to stand up, he does so in slouching fashion, and remains fixed in any position we choose to place him in: if peaked along, he walks a few steps only, then halts, and is again transfule; if peaked towards an shetter-tion, as a table or bedieved, he thoughts constructions of the obstacle by tending to very round with each stop so as to avoid it. If we make his arms, they are found to be itemy and combooms, and not so readily adapted to varied posturing. There is an absence of that lightness and firminity whereby they may be, so to speak, maded into any form, this absence of planticity in due to resistance, which is very approached in our patient's state. The contraction of the numbers is not sensived or in any degree influenced by fraction, by kensaling, or manage. If, new, we place our potient in an upright position in a chair, and incline it at various angles, we find that he adapte himself to the afternal position, and maintains his equilibrium my to a rectain point, when he allows bounded to fall. The

systele are partially cloud, reme opening, and the systells are correlatedly stated upwards, so that it is impossible to examine the pupils. There is often, but not constantly, rapid closes of the systells, which can be arrested by form preserve of the fingers over the supen orbital mostle, and is always increased by forcibly ruining the upper lid. The fine has always a most stapid, heavy expression, and cover indicates mustal pain or distress the head falls forward on the cheet, and resists efforts to raise it. It should not, he does not appear to notice what is said, although he starts at a cadden shock; if pinched or pricked by a pin, he does not flasch, but has on one too store evidence of feeling—a tear trickled down his cheek. The kneep jeck is reaggerated is both logs. He makes no attempt to feed himself: the mouth is kept family closed, and the spoon has to be locally passed into the mouth, when he immediately swallows the holes of food. He is, in all respects, intenly negligant and unclearly. This patient has not spoken a second for the period of there musts.

The blood, examined by Gower's Lemacytometer and homoglobine enter, gave the following results —

Red Corporation. Biomoglobia. White Corporation Calmi per Corporatio.*

100 per Laumin trail. 88 1/2 to 80 1/2. 12 per Laumin trail. 68 1/2 to 90 1/2.

He had remained in this condition for exactly three years, when, one morning, he spoke for the first time, became mildly excited, and shooted along the name of certain patients around. It is noted the next day, that he sat with his eyes open, subduing with apparent interest what went on accord, that he looked for some bound and choose, but would not neply to may questions put to him. He was and of times constigute, and one negligion to his habits: "another putient makes him laugh by imitation."

This partial relief was, however, attended with loss of fieth, pallor, and debutty, and be continued for nearly three mouths in this condition, occasionally lapsing into more profound stupor. At this date an above, glandalis is origin, was spend in the peck, and a little later, defines at the right base and increasing fieldity revealed parametric consciolation. He was put to bed, and almost immediately upon this regained a more normal state of consciousness. He become charry, bright, chally, and it was resident that he was rapidly recovering from his mental decongeners. He was kept to all weeks bedealdes by his attack of parameters; but from the first, his mind remained clear, and no lapse of stoper intervened.

Just prior to the appearance of chest symptoms his weight was 166 lbs.; three months later, with entra diet and cod-liver wil, he weighted 146 lbs., looked rigorous and robust, and was an active, cheerful, and fairly intelligent word helper. He recalls certain insidents during his attack, as the spening of the abscess in the neck, the feeding and clothing by his attendants; but, for the most part, the whole three years are a blank to his mind, and he gives meet havy accounts of biswell just prior to coming to the asylom, where he thought he had been resident but a few months. The blood examined, just prior to his discharge from the asylom, gave the following indications:—

Xel-Orpodes.	Elemoplohin.	White Corposition	Value per Depunds.
100 per harnic unit.	90%	-26.	90 7,-

[•] Verster has observed a frequent increase of the hamoglobia tegether with a rise in specific gravity of the blood where conditions of venous ettais invasit, and especially in melancholis and apathetic dementis. He regards a percentage of hamoglobia below 90 in the main, and below 53 in the female, to be of pathological against same —(Afigenese Zeibohr, f. Proch., Ed. 1., Heft 3 and 4).

STATES OF EXALTATION.

Contents. — Manimis Reductions - Falters of Attention—Exfectled Synthesis— Translate Delustre States—Exalted Sense of Proofers—Impulsive Conduct— Nucleonal Union—Sectorion Fosters Hallicitation—Serval Ulivious—Stadeum Melascicideum—Enleshed Imagination—Rodly Symptoms—Periodicity of Maniscol Phenomena—Acute Deluges Mania.

Viewed from the clinical aspect, cases of mental depression chiefly impress us with the prevailing Sectors of mental pain; although, as we already have seen, mental pain is by no means an coccurint element in states of mental depression. The latter term to us connectes far more than simple melancholic pain, since we regard all cases of simple intellectual torpor, morbid apathy, and states of simple staper (all of which may be devoid of painful emotional states) as comprised under the category of states of mental depression. In like manner, although we may take the prevailing emotional time, the exuberant flow of thought, and the general objective indications of maniscal excitement respectively, as characterising states of mental evaluation, we must remember that any one of these indications may be variably pronounced, or even suppressed. We should, therefore, carefully define to our minds the connotations of these respective terms-exaltation and depression; and we shall then learn that the more arbitrary, parrow, and exclusive our definition, the less readily do we perceive that the one is the converse of the other; and that the freer our definition becomes, so as to embrace all mental operations within its limits, the more readily do we find in the infinite varieties of both classes, states in the one which are the exact antitheses of states in the other.

It is, however, of far greater interest to recognize, in the morbid process which underlies these states of mental exaltation, that the process of reduction is usually more sudden in its conet, more rapid in its course, more intense, and the level reached always lower than that of simple mental depression.

Mania is far more prevalent than other forms of insanity amongst the less civilised races of mankind; thus the percentage of assais amongst the Kaffir race is given at 67, and melancholis is distinctly rare, and not acute (Grossfee). In reference to this interesting fact Dr. Groenless writes;—"If we consider the theories of those who maintain that while mania represents a loss of the lower developed strata of the mental organism, melancholis indicates an absence of the higher and latest developed strata, then this prevalence of mania amongst natives of low developed brain-functions goes far to prove this theory."

[&]quot; "Instally amongst the Natives of South Africa," by T. Duncan Greenless, Journ of Montal Science, vol. 181, p. 72.

In states of mental exaltation, we also trace the same failure in object consciousness, with the corresponding rise in subject consciousness, which states of mental depression present, but how different are the features of the two viewed in contrast.

Here we have in the welling-up of feeling, pleasurable emotions in place of poinful states; a general sense of well-being, exuberant joy, excessive hilarity, an overflowing of the spirits in generous impulses, an egoistic self-confidence—all strongly contrasting with the grim foreboding of coming evil, the glocmy aspect of the present, the sorrows of the past, the sense of the subject's helplessness before an encreaching and malign environment. So also in the rapid flow of thought—disconnected, incoherent as it is—expressed in rapid unterance, associated with restless movement, energetic pantomine, and a sense of utter lawlessness (often issuing in reckless conduct), we have a striking contrast to the aloggish idention, enfeshed imagination, apathy, paralysed energy, and restricted movement of the melancholic.

Yet, fundamentally distinct as these mental states would appear to be, we have little doubt that the process of reduction is the same for both; but in maniacal states the dissolution is to a greater depth the difference is one of degree.

All maniacal conditions are pre-eminently distinguished by a failure of attention or of the capacity for serial thought, and a rise of the purely sensions in place of the intellectual operations—in fact, the latter are unfoculted, and the emotional elements are aroused; and, as before indicated in cases of objectsion, the intellectual sphere presents the negative, and the sensions the positive results of the reduction."

Since seriality of thought requires high surrous pressure—a hightide of the nervous wave to force the ultimate ramifications of the cerebral cortex—so here in mania we must recognise an ebb of this cerebral tide, corresponding to the lowered plane of psychical activity; for the activity which we recognise in the excitement of lower levels is one of disorderly ungoverned thouse, indicative of the removal of the influence of higher controlling planes.

Of the three laws of association of ideas which regulate our normal mental operations, the law of association by similarity embraces opera-

"Just as the sensitiveness of the retinal field declines progressively from one acutely resultive spot outwards, until impressions received upon the unterested peopleral areas are more and more direly perceived and eventually falls, and just as we tend by concentrating our objective gave on a fixed point to limit the field of commons perception and to press and of reservoissess those shactno faint emitations of the outer field of vision is with the mental field, as the serial line of thought becomes restricted, as object-manifolds field in vigour, so there are always present, but are, for the most part, contaded from the immediate gave of the minds eye.

tions of a far more abstract nature than is the case with that of association by contiguity, and the same may be said of the latter as contracted with the process of association by accident or incongruity. It is the more abstract representative processes of association by similarity which are first involved in manieral reductions—the less abstract presentative representative processes not being so far involved. This fact explains much of what we observe in the maniac's conduct; his perceptions are crude, and his notion of the suspitial utility of objects around him is frequently at fault—the result is often comical, but at other times it is disastrous to himself or others. Thus we may see such a subject trying to put his coat on by thrusting his legs into the sleeves, mistaking the garb for a pair of trousers; here we observe that the association by similarity suggests to his mind only imperfectly the utility of the garment. In fantastic attempts at decoration, in the wanton destruction of objects around, in the tearing up of clothing and hedding, in the swallowing of garbage, and in some of the most repulsive tendences of the maniscal, we must recognise the failure of consciousness implied in the imperfect operation of association by similarity, and not refer such arts, as is so often done, to shoer wilful establish The imperfect operation of the same law is seen also in the remarkable rhyming tendency presented by some, viz., that of stringing agether, in verse, numerous lines utterly devoid of sense, but in which a wellregulated rhythm pervades the whole, and each line accountely shomes with its fellow. Numerous instances of the restricted operation of this law will occur to any one familiar with the vagaries of the image.

It is in this failure of the highly representative processes that we must also learn to trace the early origin of those deluded states to which mania and metancholia tend; for we may well see how by their failure some presentations are not so likely to have their failuffications corrected—an appeal to a higher tribunal is not permitted. Transfert delusions thus characterise the maniacal turned throughout its history; they are often but indications of a want of balance established between contiguous groups by discharges from higher controlling scalus, leaving, so to speak, certain inless "flooded;" such perversions are of a very recoverable nature. As contrasted with the fixed perversions of menomania, Grieninger thus alludes to them —

"But if these two forms in their extreme degree are so uttarly distinct as methally to conside the possibility of ministing the one for the other, still observation shows that in same a stell such delivered them of self-importance are by no means untroquent, which certainly ought not to be regarded in an ento-logical sense as 'fragments of monomania,' as phonomens of quite as ther affection which is this core present themselves in a very simple form, but as the result of the presery result condition. . They if it, the delicion along there is the meanly and presignancy which against the restory aginer of the small the.

they become so confused in their hurry, and pursue such other so regidly, that they have no time to become fixed or to dwell in the mind." *

An "ever-action on lower planes," as Dr. Hoghlings-Jachnon would term the state to which we allode, characterises these manismal states in the intellectual sphere, revealing a profound failure in object-conscisuouses. Ideas arise in extremely rapid sequence, often as the mere result of casual or accidental association, the subject being swayed by every passing incident. Every degree of incoherence may present itself according to the rapidity of the cerebral processes at fault; yet, in all the simpler forms of manis, a temporary command of the attention can be obtained by an authoritative gesture, command, or other artifice, when a perfectly coherent statement may be elicited, the memory annibit neemal vigour, and reason momentarily assume her away; then they puss back again into the wild turnoil of disconnected ideas and strange mental combinations. It is in the changeable, fleeting nature of the mental images that we hope for the patient's complete restoration to mental health.

It must not be imagined that all states of mental exaltation imply the tunultucus cureer of ideas above described. Ideation is always quickened by unnatural vigour—the images become more vivid; but a superficial coherence may be observed which enables the patient to hold rational converse, to employ cogent argument, raillery, surcasm, or wit. In the simplest types of mania, slight garrulity, a restless movement, and rapidly-varying mood may alone betray the mental distantance.

If we turn our attention to the sphere of subject-countionsness, we find here in the majority of cases a rise of the pleasurable emotions and an unwonted sense of freedom, undoubtedly engendered by the coincident, unrestrained activity dominant in the intellectual aphere. The high-tide of the emotional wave reacts on the intellectual aphore—the exalted self-feeling issues readily in action, or begets with equal case notions of power and self-importance-transient delusive concepts, which rise as new creations, answering to the prevailing mood. The exuberance of feeling usually expresses itself in goalwill to all mankind-in a universal optimism, which often issues in ashemes of philanthropy as impracticable in their nature as they are transient in their duration-in extravagant and ludicross proffers of patronage to science and arts; or the mood may vary from this to one of supreme aerogance, in like manner conjured up by the exaggerated self-feeling; and the subject may announce himself to be some mighty personage, and assume a defiant, threatening, or myage aspect. We choose that these reductions in maniscal states bring the

^{*}Op. cit., p. 256; see also Theodore Kolle on "Variability in Delmina" — Allgemeine Zobschrift für Phychiatric, Ed. alix., Heft I and 2.

subject to a more automatic or instinctive level; impressions received from without are liable to issue in immediate action—mature deliberation no longer characterises the mental operations, but a state of exaggerated mental reflex; in like manner, the animal passions and instinctive desires, ancevered, as if were, spring into life and show an unregulated activity—impulsive conduct, therefore, is especially prevalent in states of mental exultation, and the meniac may be destructive, violent, blindly impetuous, or dangerously homicidal, or react to any of the grosser animal passions and instinctive desires by which he is awayed. It is this instinctive level to which manifely reductions attain that characterises the features of mania as contrasted with melancholia; and, as will be stated later, the prevalent psychoses of earliest childhood (prior to the evolution of higher grades of mental activity) are psculiarly instinctive forms of derangement—mania, not melancholia, and wholly devoid of delusional accompaniments.

Nocturnal Crises,-The insure are peculiarly liable to be affected by those orelical conditions which are recognised in the healthy individual, and thus the periods of waste and repair, embraced by the day's labour and the night's rest, are shown in their case also. phenomena of noctornal crises, and the periodic character of their excitement, are very notable and well-recognised facts. The daily routine of work may be passed through in a quiet, orderly manner; obedieut to the "law of the room" and the injunctions of the nurse, tractable and resignable in conduct, the insane may exhibit no outward indication of mental anomaly until more closely examined; yes, invariably, as night appenation, they pass the hours in lead, boisterous excitement, shouting, singing, incomantly chattering, replying to imagined voices, restlessly was dering about, or beating the doors or shutters of their room. During the day, the association with their fellow-patients, application to their various duties, and the general discipline of their immediate surroundings may have just sufficed to engender that central over their conduct to which there is now no incentive. The seclasion and quiet of their rooms, the release from all imposed reserve, permit of that wane of object-consciousness which is invariably followed by a rise of unbject-consciousness. This necturnal erisis must be regarded as the outcome of those rhythmic changes, which, in a normal state, should insue in sleep,

Such reductions, however, are but partial, spannodic, and limited to psychical processes only—whereas in sleep the whole excitosuster apparatus is more or less deeply involved. In alsop, object-consciousness quickly, even socidenly, successible; subject-consciousness goes recresfuely, and the more profound depths are not usually reached for an four, or even longer; the reflex excitability of all the nervous centres (spinal also) is reduced—the organic functions are lessened. In these

cases of nocturnal excitement, however, the effect of this periodic layso of consciousness is to call up more turned at lower levels; all those subjective states arising from epi- and ento-peripheral stimuli, or centrally initiated, become the subject-matter of the mental view; all those disconnected and simultaneously originating ideas which crowd the mind, and which, in healthy waking states, are reduced to serial, orderly thought, now run rist—and beyond this hallocinations of the special senses prevail.

Seclusion tends to foster hallocination; this fact, so well recognised amongst the criminal community in prison life, is especially true as regards the instance. It is to the existence of hallocinations that we must largely attribute the infomnia and noisy outbursts; and it is an un-localited fact that many such cases, judiciously relected, are benefited by removal to an associated dormitory, and thus nights previously passed in noisy excitement become intervals of repose and quiet.

Such ballucinations, often peculiarly vivid, faccinate the mental vision, and according to their nature call forth corresponding results—the patient may be passionate, wild, theretexing and defaut, object with serror, abouting in alarm for account, joyans, exuitant, or in toristerous merriment; every phase of emotional life may present itself as the hallocinations vary, and he ensets his little drama alone.

In general paralysis these nocturnal orgies are frequent—noisy resttrances, with or without halfurination, accompanying the later stages of most cases.

Hallucinations are not infrequently referred to one aide only ; but, more frequently bilateral, they may alternate from side to side (Toulouse); or, being quasi-bilateral, may vary in their character, assuming thus, in suditory hallscinations, a hostile, threatening, abusive tone on one side-a consolstory, cheering tone on the opposite side (Magnan). These antagonistic hallucinations are of extreme interest. In 39 cases of unilatoral halls cinations observed by Toulouse,* hearing was involved in 26, sight in 7, sight and hearing in 4, sight and touch in I, and in one other case touch was also affected. Of the 26 unilateral hallucinations of hearing 23 were strictly suilateral, I case alternated from side to side, and in 2 others the bilateral antagenistic features allufed to above were evident. It is a well-known fact that undateral hallnemations of hearing may appear in focal hemispheric lesions. Thus, in an epileptic subject with right brachiofacial paralysis, aphana and lateral homonymous bemiopia, and, on another scension, associated with four of sensibility, there was the accompanies of suditory hallscinations on the right side (Pick). Unilateral hallominations of hearing and, vaguely, also of sight occurred

^{*} Gas. d. 1864., May and June, 1892.

^{*} Neuvrilegisches Central Matt, No. 11, 1892.

in a case of alcoholism, where Jacksonism spilepsy (with other symptoms indicating focal lesion of the right hemisphere) existed—the auditory ballucinations being restricted to the left side.*

In many, the hallneigntory phenomena are recognized by the patient as having no real objective origin, and yet they will be featured by the featuration which they entail; especially is this the case with sexual Hlusions, which are frequent in the female sex, and which, it is probable, are very largely entertained and featured. Cases occur where the necturnal reductions having been recovered from the patient is filled with resource or shame, or accuses certain individuals of criminal conduct, accompanied by threats of retribution and violence; each night the phenomena recur, attended by crotic excitement, and each returning morning they form the incentive to indignant procest or violent conduct.

To many again, the reductions entailing rambling, disconnected thought and garrality, are in themselves a source of pleasure—easily controlled when the patient is brought into association.

The exhaustion which often follows such nights of excitement and, possibly, the accumulation of decomposition and waste products in the blood, induce in many prolonged also phyroughout the day.

Mania,-The insubstive period of mania is but a record, in most cases, of a very gradual decleration in mental vigour, not perhaps at all suparent to the friends, but sufficiently evident to the subject hisself. Intellectual operations become more laborious than usual, thought is aluggish and tends to wander (attention being functions); strange and annual lapses of memory occur—the patient is "absent" and forgetful. All mental operations are not only difficult and tedlogs, but are followed by weariness and ennui, and a gloom overspreads the mind, for which there is often no obvious cause. At night the subject is restless, obtains but little alcop, and awakes unrefreshed, with gloomy forehodings, and a disinclination for all forms of exertion; in fact, a frittering away of nervous energy has brought him into the first stage of his malady—that of simple melantholic depression, to which all the foregoing remarks we have made with respect to simple melancholis apply. This, the first stage of his restrictions, is the stadium melancholicum which precedes all forms of mental disease. It is not implied by this that the subject necessarily exhibits such a stage in all moss-although, undoubtedly, many cases cited of sudden oaset of excitement without previous warning, are instances of a defective observation on the part of others. The absolutely sudden onset. of memiated symptoms does occur at times, as in instances of epileptic insanity from earlier and severe discharges ; use is there my prime facie reason for supposing that such serious and sudden reductions

^{*} Toulouse, inc. inc.

should not occasionally be induced. We must, however, regard the melarcholic stadium as the usual feature, and the sudden onset of mania as quite exceptional. This premonitory stage is of most variable duration, ranging from days to weeks, or from weeks to months; it may pass off under favourable circumstances, and again recur as former conditions of life are resemed.

Then suddenly, and often quite unexpertedly, comes a marked transformation, signalising the massiscul reduction. The gloom and despondency appear to be lifted off-reticence and brooding are replaced by sociability and vivarity: a strange light gleans in the eye; an animated expression replaces the pained and stolid aspect; the moods are mobile, and an exalted, pleasurable self-feeling pervades the subject. His thoughts, no longer under painful restriction, flow in unlicensed freedom and in unwouted rapidity, reproducing the symptoms of early alcoholic intoxication. The patient is garralousobtrusively so: talks about his own affairs; is confidential and communicative to atter strangers; is eguistic, makes profuse offers to befriend all around him; is cuergetic in his movements, increasuntly restless, and rapid in his atterances. If we test his individual faculties, we may find his memory fairly intact, or partially obscured, upon syeuts occurring during his maniaral attack; his attention is commanded with more or less difficulty, according to the intensity of the excitement (depth and extent of reduction), but in all simple forms of mania it is readily brought under control; yet only to lapse the next moment before the tumultuous flow of incoherent thought. If we leave him to his own devices, and listen to his rambling speech, we discover that fragmentary condition of language which attests the want of substrence of ideas—a weakening of that synthetic process which renders intelligent and rational thought possible; a cohesion of ideas still is apparent, but it is that of the trivial associations chiefly, and suggestive movements, attorances, or other impressions presented cantally by those near kim, will often blend promisescustly with the subject-matter of his thoughts, in the most grotesque and unregulated manner; and, as we have before explained, the seriality of thought becomes impossible. Every degree of incoherence may thus present start, from the mildest occasional rambling, to utter incoherence, where speech is quite unintelligible, as in the doopest reductions of typho-manta or acute delirious-mania. The patient is reduced to a more automatic level; his actions are more instinctive than volitional, just as his ideation in more refex in its arousal and expression. A slave to every passing impression, to every casual thought, to every emotional insitant, his conduct is wholly unpredicable, subject to no rule or means of calculation. The maniscal subject is not imaginative, in the proper sense of the term; at times

we find what savours of imaginative vigour, but all such glesus are superficial, transient, and accidental; the strangest combinations of ideas most necessarily prevail at times, and produce this apparent imaginative turn-and the unexpected scintillations of wit which characterias certain maniscal subjects. Like the child, his imagination is feeble and incheste, and, like the child, too, his flines fancy wanders aimlessly, and replaces the truly synthetic, creative operations of the imaginative faculty. Judgment may be perverted as-on costain points, but is just as frequently unaffected; in fact, the mental faculties exhibit only such derangement as would occur from the egressive activity of the maniscal process-a transient confusion or partial empension due to the rapid flow of ideas. By this we do not mean that the subject of mania does not suffer from delusions. Delusions are a constant feature in maniscal excitement; but they are extremely transient, rapidly varying in their nature, and changing with the ever-changing mood; their superficiality declares itself in their continuous displacement by fresh delusive ideas, for they do not remain permanent, as in the false conceptions of so-called monomania. Their origin can be attributed only to the confusion and turnals of ideas occurring with the emotional tackground of emgrerated well-being and unnatural egoists; in fact, on the prevailing tone of the moment seems to depend the character of the false belief entertained. The following case illustrates what we have just said :-

G. B. L., aged twenty me, single, by occupation a dyer. A young man of molerate height, minutalite, pale, and amounts, with an interior tinge of skin; a erry estreating forehead. Last year he had suffered for some five mouths from a similar attack to his present seizers. An uncle of patient's was depressed, but an further due to herolity was obtainable. He told millered from convolutions during destition, but his health had proved natisfactory up to his first attack of munic. He had been somewhat intemperate in his habits. He was in a state of continuous maximal excitement, charting aloud, singing, laughing, and perioditing fractionly. At first he did not sleep well, and was nearly through the night yelderal was given with good results. Through the day he was bolaterous and uaraly, sambling incoherently, and destroying his clothing. He may the walls with his knackles-calls out in imperative tones to imaginary individuals with whom he holds occurred; but calms down on being spoken to authorizationly, and condingends to give pertain information respecting binaelf in a grawlione style and a pompous voice. In almost the same breath, he declares bisself to be the "Prince of Wales-the Prince of Pears-Land of heds and King of kings; his mother is the Duchess of Kont." He is fully aware that he is in the West Paring Asylves, and gives correctly the date of the mouth and other purmedica. He assume factastic attitudes, which symbolise his premiling feelings for the time; strate about in pospess style, throws himself into m attitude of empt attention; or with lowering have and clearled teetle ages an aspect of rage and defence; then, as suidenly, with a lordly wave of the hard and gracious entic, he addresses these around him by dignified talks, the very next metent to lapse into the closer and tree engenerosalts about his room. At one moment be amountes himself as General Gordon at another he is Sir Garnet Websiley, and by tone and genture assumes a military hearing. These rapidly varying definional states, the one supplicating the other, all indicate the agoint continents of the mird, the overflow of animal spirits, the superabundance of energy finding free stal ready expression in increases incomment, partonized, and speech. From the very outest, his habits were negligest and degraded, and he was easily found to be addicted to manufactions; his gentures, also, and expressions often indicated a second emittement. When referring to insuring at the adulment period, we shall find this arrogant and equatic state of paind to be often associated with habits of masterbation.

In the centre of six mostle, this potient's excitoment entirely disappeared, and he was able to give a fair account of his feelings, affirming that he believed himself, throughout the attack, to be some great personage with salitary functions.

The explorant swell of feeling, and the torrent of disconnected ideas, may express themselves in continuous garrulity, in noisy chattering, in threatening and abusive tones, in laughter, singing, or load shouting, with corresponding pantomine and abuset ceaseless activity; or the feeling of unusual freedom and energy may find relief in destructive tendencies—smashing of glass, breaking of furniture, tearing of clothing, or, perhaps, in violent aggressiveness.

The rapid alternations of disposition are peculiarly striking; the surging of the omotional wave is followed by an ehb, only to resoresr. in other forms, so that intervals of calm may find the patient even reticent, despondent, or abjectly miscrable, until some triffing cause lights up the flame afresh. These intervals of depression are in nowise different from the melancholic states; in fact, it is but a step from the maniscal to the melancholic stage. At this instinctive level, the patient instantly reacts to the most trivial excitant, with unter disregard to decency; peripheral irritation may thus induce open and shameless masturbation, or nymphousniscal states may render the subject of either sex repulsive in the extreme. In like manner-dirty, degraded, negligent habits arise, and depeaved appetites spring into life. Sensorial disturbances, in the form of illusions and halforingtions, are of very frequent occurrence in mania; and, at times, it becomes difficult to engage such patients in conveniation, so intent are they listening to these phantom voices, or busy shouting aloud their replies; or, whilst talking to us, the rapid turn of the head, the harried gesture, the interposed exclamation, or irrelevant remark, indicate these sensorial phenomena.

Bodily Symptoms.—Although, in a certain proportion of cases, superially in alcoholic and senile subjects, and in the maniscal excitement of general paralysis, we note considerable injection of the vessels of the head and neck with a unfined superit of the face—the great majority of maniscal subjects undoubtedly exhibit worked puller of the face—the skin generally being also of yellowish tings, uncluous feel, and foul

odour. The pulse is small, somewhat frequent, and the heart's sounds are often muffled. Griesinger* speaks of the heart's sounds as being indistinct during the parexysm of excitement, and becoming elear during moments of calm; during the manianal parexysm also we learn from Dr. Clifford Allbutt t that the optic disc is ansemic, becoming, in a few days subsequent to the attack, suffused and obscure. The spans of the retinal vessels, presumably present in these cases, appears to us of great importance in revealing the true nature of the maniacal process as distinguished from states of mental depression.

The tongue is often coated and foul; the bowels are torpid; whilst the appetite, sometimes indifferent, is more frequently exalted and often insatiable. It matters not how well the patient takes his food—incessant activity and continued insomnia are sure to result in loss of body-weight; in most instances great essaciation prevails—the face assuming a pinched appearance, the features are sharpested, a dark areals surrounds the eyes, the eyeballs are insken, yet restlenely active and mobile. The re-instatement of a well-neurished frame is a rapid process ort pur, upon constitute of the manistal symptoms. There is frequent interference with the menetrual function, during the course of manis. Despite the increasant motor agitation and excitement, the body temperature is apprexial and normal

Periodicity.—During the course of maniscal excitement, a remarkshie periodicity is often noted in the exacerbations and remissions
which occur. We have already alluded to the nocturnal crises which
see very prevalent, and we may now draw attention to diarnal variations of excitement and calm occurring upon alternate days, and to
which the attention of the nurse is often attracted—an observant
nurse will often speak of such a patient's "quiet day" or his "but day,"
referring to this strange alternation. We quite as frequently find
the subject alternate between mental exaltation and depression from
day to day, and this ready transition from one form to the other
appears to us of the highest importance for a proper comprehension of
the pothogenesis of these mental states.

The mentrual molimen is especially prone to accove in these subjects an exacerbation of excitement, so that a monthly periodicity in these maniscal outbursts (with more or less complete remissions intervening) is by no means infrequent. Frequent relapses occur in certain subjects, apparently attributable to the vicious habit of masteritation maniscal reductions and stuporose states being often readily incurred.

^{*} Op. 411. p. 288.

⁺ The Oylche/message in Discount of the Norman System. Dr. Albert's classess town are based upon the maniention of as many as fifty one cance of manual at the West Rolling Avylan.

Prognosis.—Acute mania occasionally proves fatal; the explanation of such an untoward event is the presence of some intercurrent affection such as pneumonia, the exhaustion of phthinia, or the association with septicemia, as in certain forms of pserperal mania. In fact, purposed mania occurring as the sequel to exhausting homograpes sate or post purpos—is a very grave affection and not unlikely to issue in a fatal termination. If we exclude the mania symptomatic of typicpay, general pseulysis, and alcoholic immuity, we may state that simple uncomplicated scuts mania is a remarkably recoverable affection.* Exceptions, however, occur even in uncomplicated mania, where, from the neglect of early and judicious treatment in greatly debilitated subjects, doubt enems.

Far more frequent than a fatal termination to the establishment of chronic mania, in which a permanent mental enfeeblement results, associated with recurrent attacks of excitement. Especially ominous of this termination is the return of physical health and vigour, the re-establishment of the outritive functions, the tendeury to extrusions, or actual obesity in some cases, with no corresponding improvement in the mental state, but persistence of the muniacal reductions, and a general mental sufceblement. States of moutal enfeeblement including obrough marrie, consecutive dementia, and the monomariscal pervortions represent the several modes of unfavourable termination when recovery does not cause. The mode of recovery varies much in individual cases; it may be alread-to alread that is the course of twenty-four hours the patient may emerge from a mate of acute excitement into one of coherence and perfect calm, with, it may be, a slight confusion alone recognisable; such terminations are not desirable, and almost certainly issue in relapse which may recur over and over again ere permanent recovery is ansured. The more reliable process is a ateady return to former levels of mental life; a process of gradual evolution, broken, it may be, by slight reductions in which excitement temporarily increased invariably leads to subsequent stages of clearer conscioumest-a process in itself both instructive and reasoning. Savage affirms that the more prolonged the initial melancholic stage, the langer is the second stage of excitement likely to be; the longer these two, the less aspecial the prognous; and the greater the assount of excitement, the greater is the tendency for the patient to pass into a condition of depression afterwards.

^{*} Reference to the table of results on p. 221 will illustrate this fact, bearing in mind that the percentage of double in some munic (13.4) heliades uncomplicated as well as all complicated cases.

^{*}Such abrest terminations of manifold excitement are upt to take place on the occurrence of some arms bodily affection—e.g., presumonia, orynipolas, the appearance of surbancies or boils—by some regarded as suggestive for a derivative system of treatment.

Age is a factor of much importance as regards the question of recovery; the younger the subject, the more likely is he to recover. We do not even exclude the manis of adolescent insunity here—so far as it relates to the female sex; but, should the psychosis characteristic of adolescent insunity occur in the male, the prognosis is far sorre unfavourable.* So, likewise, for recurrent manis—each occurrence serves but to re-establish a still greater tendency to maniscal outbursts, the attacks becoming more frequent, the intervals shorter, and the enfectionant of mind steadily progressing.

Acute Delirious Mania, - This, the delire aigu of French writers, represents the most profound maniacal reductions which we meet with, just as simple mania connotes the symptoms of the milder reductions. The disease is often soust sudden in its onset, and frequently appears to follow upon some storal cause - shock or fright. This, however, is attributable to the special predisposition of the subject, evidence of excessive instability being in most of these cases afforded by the history. It differs from cedinary syste mania in the intensity of the process, the extreme reductions in object-consciousness, the absolute oblivion in most cores to all around, and in the repair course and frequency of a fishal termination. It is quite exceptional for a case of acute mania to prove faml; in feet, unless the individual is much debilitated prior to the muck-suffering from some exhausting ailment, such as pathicis-or when it is the sequel of exhausting homoerlages, as after parturities, we augur well for our most wildly-excited patients. A case of ancomplicated acute manis usually means a certain and rapid recovery. Not so, however, in acute delirious manis; here the outlook from the first is most coninous, and the gravest prognosis must be given. The tongue is dry and brown; the lips and tooth become covered with sorden; food is often most peristently refused, and violent struggles made upon attempting artificial feeding. The patient is usually quite oblivious to our intentions, and obstinately resists all we do for him. He presents a pitiable spectacle, is unsteady on his feet, totters and aways from sheer nuncular debility and exhaustion, and trembles in his limbs. His atterances are a broken strain of completely unintelligible jargen-the incoherence being absolute; the lips tremble, and speech becomes eventually a giere habite of martieniate sounds, interspersed with solding respiration. Sleep is entirely abolished, meacular wasting rapidly proceeds, and in a few days he is so prostrate that he lies helplendy on his bank, snable even to assume the sitting posture. He now represents the conflition often described as typho-mania. The temperature is always misel more or less, cometimes to 102". The urme may be admity or suppressed; it may pass involuntarily, as do the stools. If intelligently-directed treatment

^{*} See reder formula of Poleria and Adolescen-

be not early adopted, a rapidly fatal termination ensures; and even under the most favourable circumstances, the struggle to bring the patient safely through the storm is an anxious and prolonged one.

Orses of Dulimous Memir.

A. II., a nurried woman, forty oversymm of age, was atteited after excitement of seven days' duration. She had suffered from mental desuggeness some four years ago, attributed by his friends to because passing away from his home; was under treatment at an arylam. A week ago the same see again decamped from boses, and the mother's distress collainated in the present science.

No history of mainty, neurons, drink, or other vice in her accestry. She was a very manifeld subject, of pullid, suffice, pusty completions, with diluted maker vendes; there was a strongly marked distingent strabionus. She was suffering from considerable brenchial materia; the pulse was 148, regular, but very small and foolin. There was notreme anomin—the jave were obsertations, the abdomess marken, the left hyperdominimum rather tender, as splenic enlargement. The genitouring system appeared mental.

She was restless, excited, trying incommodly to leave her bed, and talked continually—attering ejaculations such us, "Oh! my Got! what shall I do!" She was extremely prestrate, functed on admission, and nonrishment had to be formidly administrated by means of the stomach table.

She did not sleep the first night, and next morning was in a condition of acute deliroon excitement, redling her head about in hed, toming her legs, furnising with the bedelother. All her atternaces were immuoual and completely incheren. When niked why she came here, she remarked—"To drink! it makes great distinction in the era of your hostons—Follow me—I have been in the fermions of giving drink—Oh! oh!—I am receiving gentlemen, my you. Remember the sex—The fermions discretion of the place of my lique." She refused tool, "because it is an aboutinable, it is no obstinute to the effect of my leart." She was not violent, and her tom was elated, not depressed.

Essence of best with milk, eggs, and post wine (8 are, daily) were ordered; 10 grains of the citrate of tree and quinner, for the. Two days as sequences to admission it is noted.—" Exceedingly prostrate; pulse 120, very feeble; respectives 18. Sies was unity and sumbling last night, and is quite insolverent this marriag-release food; bewell torpol; tongue swellen and glacut. Acute delicious condition has so far subsided as to permit her partially to understand what is said, and to ruply coherently; compulsory feeding has still to be reserved to." The following day it is stated that—" Patient was more than simily social again last night, repeatedly agrang out of bod, and jumped into the patients' bods. Slept our hour after two ourses of standard. She remained sleepings and wild all night, despite a solutive then given. Has taken her food for the first time voluntarily."

On the lifth sky following her admission, she was fairly calm and rational, having slept some four hours during the night; but there was now noticed a considerable swelling over the left parcetal region, so that she could hardly open her mouth; the late of the ear was also rul and inflamed, the pales had improved in quality. From this data, the patient improved rapidly in mind, and she was quite onvalueurs three days after the appearance of the swelling. The latter had extended true the masteld region and down the mack, quite abstraing the angle of the jaw; the integrament is of a rather competed reduces, thickened, and the swelling hard and tense; the left eye is completely closed by great ushum of the labs; temperature has fallen from 100° to 100°, pulse 108. There is completable temefaction of the left tensil. Supportation occurred in the swellen part, and discharge took place from the external meature these days later. No relapse of assettal symptoms occurred, and patient left in its works from the date of her admission.

J. G., a married man, aged torty-nine, by occupation a plander, had been treated at home for the past month for montal symptoms of a maniscal type; he had violently assuabled his wife and threatened her life. His montal disturbance was attributed by his friends to excessive dranking; one point was certain—he had no immus or neurotic heritage, both parents had had been fourthily to a good old age, and no other number of the family had been mentally affected or had reffered from services discover. His drinking habits that extended over a period of image years; and evidence of nervous disease or mental flow had unfoubtedly been regarded by his friends us but the result of intemperature. Troinbly he had been deranged for much longer than was stated; yet he had worked at his regular occupation up to a few works of admission. When admitted, he was at once recognised to be the subject of general paralysis; he had pix-hole pupils (sparies myosis); his roice and hips were treathers; he had suffered their his jearney to the neglam what the Relieving-officer believed to be a "stroke."

But the important feature about his state was the intensity of his maniaral reflections; he was evidently in a profoundly prostrate condition, and was likely to siak rapally from scate messcal delirium. His arms was related, and had to be withdrawn by a very small ratheter, turing to his having a contracted prepare with extremely minute aporture; surgical measures, however, were at once adopted to referre this state. He could not stand upon his feet, but immediately "doubled up," and lay for the most part in a helpless, prostrate, dorsal decabitos. Acute visual influentations were constantly present; for made confirmous arnicles with his hands in though to group imaginary whirets, and lay mattering atterby incoherent gibberish. There were much tremor of the limbs, and manufar jerkings generally. Patient's consciousness was so far charged that he failed to appreciate the purport of staything said or done for him. Paraldebydo (mins, xxx.) was administered, but wholly failed to induce sleep; strong nourishment of milk with eggs, emence of beel, and concentrated foods, was given him, but with seach difficulty, owing to his resolute resistance and torrified state of mind. He was pule, purched, and haggard, and portionally rection through the next day, requiring regular eatheriesism, a normal amount of urine being each time withdrawn. The following night be obtained an alony, toming about methody, and mattering incomnally; the heart's action was becoming excessively enjoyhled, his litera cold, and his lim stightly systemed. Kerry presisting was observed, and small quantities of mornishment. were given frequently to keep his body warm and stimulate the remainten; but he died the following may from earding failure.

FULMINATING PSYCHOSES.

Contests.—Uniform and Partial Decodations—Detective Control—The Neutrice and Criminal Subject.—Nature of Impulsive Researcy—Linuxe Homicalal Impulse—Ensistence of Aura—Epipatric Aura—Unovering of the Brate Instincts—Hellet of Mental Tension—Historytive Cases—Suicide in Homicalal Subjects—Ericley—Effect of Physiological Cysion—Epilepsy—Masked Epilepsy—Alcohol and Impulsive Insuncty—The Mirectly Tendency—Seicidal Impulse—Kleptomanis—Diparamasis—Encourage—Impurgive Obsessions.

The dissolutions of the servous system which issue in immity by no means reduce the subject to pre-existent levels of mental life corresponding in all respects to former stages of evolution; the denudation, to use an apt term, is by no means so uniform that the mental wave recedes along the whole line of its former advance. Such a uniform recession does occur in physiological sensecence, and is still more pronounced in the premature decay of scalle dementia; but, in most forms of insanity, the demalation is a localised one, or, at all events, begins in many separate areas, and the resulting mental disturbance is wholly unlike any of the results of a uniform physiological demolation. The general results also will vary with the intensity and rapidity of the diseased process, and the factors so often insisted upon by Dr. Hughlings-Jackson in his studies of convaluive diseases must also not be neglected in considering the less soute processes of mental disease.

It is by these partial denudations that we seek to explain the incongruous results of the diseased process and the overbalance of faculties so characteristic of montal disease. At no stage in the history of insanity, except, perhaps, the senile forms, do we find the man altogether reduced to the mental state of childhood-a plus or minus quantity ever presents an exact parallel being drawn, so that we readily distinguish such anomalous reductions from the results of a uniform physiological or nathological demodation. Certain features which characterise the mental life of the child spring into obvious prominence in the adult subject of mental disease. The infantile mind is above all things characterised by the lack of control-its instincts, passions, desires, actions, all alike, exhibit in a high degree a want of inhibitory restriction, and the further development through childhood and youth to adalescence and adult age is a record of the alow progressive superposition of controlling centres. Normal mental dayslopment is specially characterised by this uniform and progressive establishment of self-control (so to speak) upon higher and still higher levels; but, just as we get in the dissolutions of disease partial denudations—so here, in the progress of mental evolution, we meet with developmental phases of a monstrous character, presenting, not the normal uniformity of level, but the bizarre irregularities, suggested here and defective there, which signalise so frequently the neurotic heritage of the subject. Defective control over certain enimal passions and instinctive desires (often associated with an intense stacesto restriction over others, amounting to a morbid hyper-sensitiveness) is a pseuliar characteristic of such predisposed subjects; whilst a still more universal defect of the inhibitory faculty is illustrated by the criminal chas of the community. The reductions of mental disease, therefore, will more resultly find their parallel in the various absendors developmental phases of the nearestic subject, or in the extremes of inhibitory defect presented by the criminal, rather than in earlier stages of the healthy and normally-developing brain, and our studies of these developmental types should facilitate our comprehension of the varied reductions of insanity.

Much may be said of the ill effects of injudicious training of the mental families of the young ere they have attained an age when such faculties should be called into speration; and we quite agree with Dr. Clouston that different brokes attain their power of centrel at different ages, and we also have seen "many children whose anxious surents had made them morally hypermethetic at early ages through an ethical forcing house treatment", but we come that all pronounced instances of the kind are nearotic subjects, as in the case of the little boy of four mentioned by him, " who was so sensitive as to right and wrong, that he never ste an apple without first considering the othics of the question as to whether he should est it or not "-yet who was, at the age of ten, "the greatest imp I ever saw, and could not be made to see that amashing his mother's watch, or throwing a cut out of the window, or taking what was not his own, were wrong at all." What we specially maint upon here is the fact that the subject presenting such mental distortions is not the product of a vicious educational code so much as the stellin of an organised neurotic heredity; and that we should in these developmental forms learn to recognise features common to them and the reductions of mental disease. So also as regards the true criminal type, the difficulty of drawing any clear line of demagnation between crime and intunity is well recognised; certain forms of insanity, more especially the so-called "moral inmuity," presenting poculiar difficulties to our arriving at a conclusion as to the degree of criminal responsibility involved in the case. Nor need this fact surprise us, since the one personals us with purtial developmental arrests at levels to which the beain of the imano must frequently become reduced; what must always be kept in mind to the fact that the one is the outcome of a developmental failure, or vice, the other is a genuine dissolution.

All noute forms of insanity are negatiarly characterised by this loss of control. We recognise it in the failure of attention and the incolearent flow of ideas expressed in sambling access, in the nurestrained passions, varying moods, increment movement, gesture, and all the outrageous conduct of the manine; but it is not in these universal and complex disturbances of faculties that we find the symptoms of "impulsive insasity," as generally understood by that term. There are sanntal affections in which the chief, may, the sole discoverable feature is this failure of inhibition exhibited in ungovernable, sudden impulse, and in entirely unrestrained conduct, whilst the intellectual and emotional apheren remain wholly or only in part unaffected. It is in this freedom of the affective sphere of mind from implication, and the purely impulsive nature of the act, that we must learn to recognise the ponuine impulsive insanity, as understood by older writers. Both Pinel and Esquirol at first doubted the existence of pure insane impulse apart from intellectual flaw or delusion; and many authorities of repute have since their sky considered the doctrine a dangerous as well as a fallacious one; yet aventually Pinel and Esquirol asserted the existence of this terrible maledy, and painted its distinctive Seatures in no uncertain colours. Either there is, or there is not, such a disease as impulsive inearity; and we must remember that our deplat of its existence carries with it the implication that the impulsive conditions which we recognize in a minor degree in healthy physiclogical states, such as the almost irrepressible desire to break a delicate glass globe held in the hand, and many other similar experispose which we are all familiar with, cannot arise in an absolutely smoontrellable form as the result of pathological disturbance. It may appear to the student an someomory refraessest to insist upon this distinction, but a moment's consideration will assure him that the distinction is one of vital import, not from its scientific bearing only, but more especially from its stedioo-legal aspecta.

The lawyer is naturally suspicious of the existence of this form of instairty, and is, very properly, guarded in his acceptance of the socteins which carries with it such far reaching results; he perceives the difficulty of distinguishing between what is and is not controllable—between an instance impulse and the outcome of criminal volition; and he, moreover, perceives the difficulty—may, the impossibility—of recognising its existence, and at the same time reconciling it with the legal criterion of responsibility; and, lastly, he must recognise that the admission of this fact throws on the medical witness the full responsibility of defining what is and what is not of the nature of an incontrollable impulse.

Great as may be the difficulty in many cases, of clearly distinguishing between the blind incentrollable impulse of the insuns, and the rash, importants act of the responsible criminal, we must not shrink from the importance duty of affirming the existence of this form of insanity if our clinical experience justifies the belief, so momentum are the consequences embraced by its acceptance or rejection.

In insisting upon such a distinction, we must not forget that it is more or less an arbitrary one—that nature improve no such absolute line of demarcation between what we elect and what we do not elect to the dignity of merbid types; that in reality, one, or a few, or many of the mental faculties may be deranged, and in all possible degrees of intensity, and so forms of impulsive insanity may merge into forms characterised by intellectual or smetional disturbance; and sice verse, intellectual impairment with delusion may merge into the typical forms of impulsive insanity, exhibiting every shade of transition from the one to the other type. What is of still further import is the fact—which clinical experience very strongly emphasises—that alternations of pure impositive insanity and forms of intellectual or morel insanity occur in trany insane subjects.

Nature of the Insane Homicidal Impulse, -In the first place, we should note the causeless or motiveless nature of the act; the impulses arise wholly apart from any incentive, Schwienal or otherwise, nor is the victim able, in the great majority of cases, to truce any connection between any pre-existing emotional or intellectual phase, and the onset of the insune impulse. Its irrelevancy to surrounding circumstances is in itself so characteristic a feature, that the antifect invariably insists strongly upon this fact. Suidenly, anides, it may be, the pleasures of the family circle, or at the moment of devotional exercise, to the intense herror of the subject, the murbid feeling suggests itself without any obvious provocation (like a plantom demon), and requires all his efforts to dispel it. The hieror of the position will often drive the sufferer to a free confession of his state, and to urgent entreaties for protection against such unbidden mysterious impulset, as numerous cases attest; but instances occur, where the autortunate subject has struggled for years with his infirmity, and never revealed his deadly secret until compalled to do so upon the commission of some desperate act." The motiveless nature of such acts may be called in question, and grave suspicion be expressed, from the admitted difficulty of always assigning a consistent motive even for the acts of the same; but, just us readily as we may ear in impating no motive to an act when such is not clearly obvious, so, we may even more easily fall into the opposite arror of assigning a wrong motive to an insure impulse, inflactured by accidental circumstances in which the subject happens to be placed. The motiveless nature of the morbid impulse is forcibly illustrated by some in which

^{*} See, on this point, Her. Burkerill and Time, op. nt., p. 268.

the subject suffers from such feelings when no one is near, or at the moment of awaking from alsep; for, as in the case of the saidfall impulse (an impulse which is equally transient), the commission of the fatal art is often averted by the absence of opportune means; so, in the homicidal impulse, the morbid energy is dissiputed and the murderous act averted by the absence of the object.

In the second place, we must note the producual indications and accompanies at of the insane surplies so far as they are afforded by subjective and objective indications. The subjective accompaniments vary considerably in different cases; in many, the cerebral discharge which initiates the impulse, is productive of a genuine nura such as often precedes the epileptic convulsion. The morbid sensation is often peripherally referred, is of sudden accomion, and may rapidly percade distant parts of the body. Thus in the case of one unfortunate victim (Reg. v. Mountain), we are informed that an intense burning heat suddenly select him in the epigasteiam and was rapidly transferred to the throst, accompanied by a sense of constriction and urgent thirst, ayou which the bonieldal fury arose, and momentarily beneft him of all control.* Others complain of colicky pains, a sense of heat in the abdomen or chest, headache, restlessness, loss of appetite, and lowness of spirits (Toplor t), of seasotions referrible to the head, "flushings of blood to the brain," a sense of constriction or tightening, as of a ligature, round the scalp, or of a feeling as if a cold fluid were poured upon the head and along the spine. Dr. Skae, in his Annual Reports for 1806 and 1865, describes a well-marked aura as preceding homicidal impulse. In certain other cases a definite hallurination of the special senses may be the immediate forceumer of the homicidal impulse. The connection of these phenomena with epileptic discharges is often apparent in such subjects, and the following case, quoted by Mandaley from Marc, seems to indicate the repression of the impulse by the arresting of the sura :-

"Mr. R. a distinguished shimter and poet, of a naturally wild and averable disposition, placed himself under restraint in one of the senious de sunte of the Paintourg St. Antoine. Termented with an homicidal impulse, he prostrated himself at the foot of the alor, and implered the divine similance to deliver him from the atrocious proposity, of the cause of which he could give no account. When he felt herself. Buely to yield to the sudence of it, he historied to the head of the establishment, and properted him to tie his thursh together with a ribbon. This slight lighture was sufficient to calm the unhappy R., who subsequently endeavoured to kill one of his friends, and finally perished in a fit of marincal fary."

The epigastric aura, followed by spann of the throat and intense

^{*}See in this connection as instructive case of hunicidal and months insuring recorded by Dr. Prank A. Elkins, Edin. Med. Journ., 1864.

⁺ Med Jurieproduce, vol. 11, p. 553.

thirst, alluded to above in one case, has been noted in other subjects,"

it is of interest as indicating a primary disturbance of the vagua, and
as giving rise to the most intense and massive feelings of seganic life,
which in the brute arouse the most ferocious instincts.

Then, Prolessor Bain says—"They (the feelings of inaution and thirst) are far more intense than more correct depression, and, therefore, etimalize a more rehement expression and a more energetic activity. Even when not reusing up the terror of death, they emits havely and ferious passions. The unoophisticated brace is the test instance of their power." And again, "There is according intensely hindling in the appetite of instances for food, which rises to furly when the floch is sented our and busine to be taxon."

The association of these organic sensations with the springing into life of the brute propensities in the human subject is, we take it, a suggestive fact. Certain objective indications of the morted process are also occasionally afforded, chiefly of vaso-motor origin—intense pallor may precede the act, or the face may become sufficied, and a copious aweat toward out over the body as the impulse is resisted and subsides; the heart country shows excited action, and the arteries of the neck and temples pulsate violently.

In connection with outbursts of homicidal frenzy the Ameli of the Malays affords instructive parallels amongst lower states of civilination. Suicide amongst the Malays, it appears, is extremely care (Ellis), but the paroxysms of murderous frency known as "running arruck," appear clearly to be associated with a sub-conscious automatic mental state, as in genuine spileptic and alcoholic automatism, the agent being left wholly oblivious to his murderous deeds. "Amoka result from an idiosynemsy or poculiar temperament common amongst Malays, a temperament which all who have had intercourse with them must have observed, although they cannot account for or thoroughly understand it. It estaints in a propensus to chronic disease of feeling, resulting from want of moral charging, which leaves the mind a prey to the pain of grief, until it is filled with a malignant gloom and despair, and the whole horizon of existence in average with blackness. . . These cases require discrimination. on the part of the medical jurist to prevent irresponsible parsons. suffering the penalty of the injured law." (Dr. Oxley, quoted by Gilmere Kliin,

The intensity of the meriod process is further indicated in the unterloss of self-control. "Everything passes out of mind," said one such unfortunate swipert to us, "except the one thing I wish to accomplish. —I can think of nothing but the desire to kill some one." The one burning idea prevails to the exclusion of all others at the height of the

^{*} See a case by Pixel quoted in Dr. Manifeley's Requestivity in Mental Disease, p. 141.

[†] The Source and the Intellect, Alon. Bain, pp. 126 and 253.

attack, and is (in all respects, as Mandaley has indeted) "a convulsive idea springing from a morbid condition of nervo-element, and comparable with a convulsive movement." In other respects the condition shows its kinship to the convulsive neuroses, viz., in the immediate relief affected by the accomplishment of the act, or the dissipation of the morbid energy in other directions; like all transient pervous discharges from the cortex, the associated mental sension is instantly relieved thereby. Yet, it must not be forgotten, that the impulse is in many instances successfully resisted; and that the early history of many cases of humicidal mania is one of a longcontinued and secret struggle of the victim against the morbid feelings which create in his mind a dread and a harror indescribable. Fully recogniting the atescisms nature of the crime to which he seems impelled, he is in constant dread lest in some weak moment his power of resistance, already ouslaved, should wholly succumb in the frency of the seigure. Instances have occurred where this struggle was carried on for years-thus in the case of Reg. a. Mountain the prisoner admitted the existence of such instanc impulses for a period of ten years prior to the marder, the exceptional atrocky of which, with orion related circumstances, make it worthy of note here,

The prisoner was a young man, aged therty-two yours, of undoubted neurotic heritage; his mother, maternal grandmother, and maternal aget had been image; his maternal nacle had out his throat, and his brother was of feeble intellect, The maternal about, who was under our observation for years, was the subject of sairtidal impulses, had tried on several counters to strangle, to hang, or to drown biresif, as the result of imperative feelings distinctly arising from the group of organic sensitions. The autorientic subject of such secretard builty had always been timed and unnaturally suspicious; but no decided debuicual phase had been observed at any time until a few mouths proceeding the number, and then only as the manediate outcome of drink. Ten years prior to the scent in question, he first because subject to the poculiar sensations which we have already referred to, and which were invariably the forestoner of intense homicidal impulses; they almost invariably occurred at tissue when he was almo, and he would pute wildly up and down his your to "work the Seeling down;" and often he has rented from the house where his uged mother and servant lived, when he felt the feeling arriving, but he should not be able to result the murdinous impulse. He had struggled against those feelings, and "grayed to be delivered from them" in agony of mind without ancome for years. They were mercasing in intensity, and to all to his misery his natural nervousness and suspicion were also more prominent.

His mother's attack of instalty some years previously, and his anet's state (when he had curied at the septune, constantly project upon his mind, and engendered the feeling that he would become instance. He had kept his dangerous feelings and propernities a profound somet, so that his closest acquaintances had failed to recognise any indications of his real condition until, latterly, when he gave way to deaking; and then it was observed that very small quantities of allohol produced gen to mental disturbance, characterised by persistent delutions of persecution and errors of identity. On two occasions he suffered from persistent

attacks of manifest excitoment, but of transcent duration only. As a network result of these intemperate habits, his former symptoms became further interestical; yet, up to the evening of the murdre innorst when under the influence of thick), no intellectual disturbinus was reorganised by his friends. On this eterning, after taking stimulants freely, he locked his mother and the servant girl in a room together, and in the most brutal and atrocious manner attacked his mother, kicking her to death, and causing the most horrible mutilation of the body, keeping the girl at arm's length by a loaded pistol. For five hours this heatal violence was continued, he mesowhile affirding abundant evidence of a deluded state of mind by his conduct and utterances. His subsequent condition upon arrest was consistent with an attack of mania-a-pota. Subsequent to his recovery from the alcoholic delimen, he had experienced a return of homicidal impulses to proon, a man who alept in the name room having muchy been a victim to his manderous freezy. The prisoner was considered irresponsible at the time of the number to the ground of treasity, and was redered to be retained during files Majorty's SOURSEY.

The case is of interest in its medical aspects as reproducing some of the most important features of lounicidal impulse in the immse. There is the fact of the peculiarly hereditary nature of impulsive insanity; there is the strange association of deranged organic semutions with the convulsive conduct; there is the emphatic proof of the fatal effects of alcoholic indulgence in such cases, and the ready passage into delusional forms of immnity; and, lastly, there is the secrecy so often maintained by the subjects of this form of malady, lasting over a period of ten years. See a notable case recorded by Dr. Tuke.*

We have little doubt that many instances of mysterious unicides are to be accounted for by the prevalence of homicidal feelings—the victim tortured by the terrible secret scake relief in self-destruction rather than reveal his condition, or subject those near and dear to him to any further risk. The condition of the homicidal subject immediately subsequent to the act is characteristic—it is usually one of complete relief from auxiety, and utter indifference to the energity of his grime; frequently his first act is to coolly confess his crime and give himself up to justice.

Exceptions, however, occur where the subject of insuse impulse endexveous to conceal his crime like the responsible criminal. Thus, at the West Riding Asylum, a subject of such impulses secured an iron bur and struck a harmless imbecile patient on the head as he lay subsep within a few yards, fracturing his shall sectionally, and then deliberately concealed the instrument in some shrubbery near at hand, and coully nock up the paper to had been reading a moment before, apparently free from the least concess. Up to the present day, four years since his homostidal set, he desires positively any knowledge of the affair, and he wishbited the usuous indifference on being questioned immediately subsequent to his violatics. In fact, his nouchalance at

^{*} Populational Material, 1974, pp. 268.

the time, and his subsequent behaviour, might almost have been regarded as consistent with the impulsive automatic act of an epileptic, were it not that the subsequent history of the case revealed clearly the existence of insane impulses preceded by a definite agra, but not of genuine epileptic paroxysms; and, moreover, proved him to be possessed of considerable insane curning. In the genuine impulsive forms of insanity, consciousness is never as far impaired as to issue in forgetfulness of the details of the homizidal act. When such is the case—when any marked obscuration of memory is apparent—we may presume the impulse to have been of epileptic origin, or to be the outcome of alcoholic delirium.

Etiology, -In all these cases of pure impulsive insanity there is, we believe, a well-established basis of a nearestic heritage, and if the individual's history is scrutinised with sufficient care, we are assured that evidence of mental instability will be discoverable throughout his life. It is, however, at the critical spechs of life that this predisposition especially tends to assert itself-periods at which grave nutritional disturbances are prone to arise in the central nervoes system, inducing the peculiarly convulsive outflow of pervous energy which characterises these species, even in normal physiological operations. Paterty and the climacteric are prone to the convulsive type of the neuroses, and the same prevails at the purperal period during factation, and associated with the various forms of menutrual decomponent. Several instances are on record where the revolutionary epoch of puberty has aroused the homicidal feelings in youth, as in the case of Margaret Messenger, aged thirteen years, who killed her brother and drowned another child, six months old, without any discoverable motive. Young girls suffering from temporary menetrual derangement are subject, as is well-known, to various perverted inclinets and appetites, and the hysterical outbursts are often associated with an almost irresistible tendency to destructiveness, and not very rarely with a brenicidal feeling (see case of Reg. c. Brixer).* We have known several instances where the subject has expressed her dread of sleeping in the same room with other members of the family, and of being left alone with her younger sisters, lest she should not be able to restrain the impulse felt to injure them.

The climacteric in woman is a period during which mental disturbances are frequently associated with suicidal impulse; but, as we shall see later on, the impulse is usually the outcome of intellectual derangement and grave delenional perversions. Yet, homicade and solution may occur at this epoch as the result of a purely impulsive condition, and more particularly in such cases as have developed intenperate habits. The puerperal period, as is well known, renders

[&]quot; Quoted in Taylor's Midded Josephadone, vol. ii., p. 584.

neurotic subjects liable to imme impulse, and, although ramilly a cymptom of the general disturbance of passperal mania, the simple instinctive form may alone prevail. We recognise a similar condition in animals, which, in the deranged states following parturition, will kill and even devour their young. Epilepsy is a frequent source of these deprayed and resistions feelings. Homicidal impulses may prevail in one of four conditions in the epileptic subject, viz.

- (a) In epileptic foror or mania, associated with hallucination or delunion;
- (b) In the so-called "epilepsia larvata" (Morel), the "masked epilepsy" of Esquirol;
 - (c) In the dreamy state of spilepsy; or, lastly,

(d) As a simple impulsive derangement during the inter-paroxysmal period.

It is the latter alone which can be regarded as genuine Impulsive Inmaity; the three former conditions are attended by such general mental derangement as to exclude them from the estegory of pure affective forms of inamity. It will be more convenient, however, to refer briefly to such forms at the present juncture, and to deal with them in further detail in our remarks upon inswrity associated with Epilepsy. In the reductions of Epiloptic Mania, or the pertiparoxysmal excitement, of which we see so such in our arriums, the homicidal impulse springs into life almost invariably as the result of The murderous act is traced to a pro-existing deludebudon. sional state, with which it has aften a direct connection (see rase of Roy, e. Taylor, see Alcoholic Instantey); or, again, hallucination of a ght. or hearing may prompt the act-a soice may be heard commanding the enileptic subject to kill, and the impulse arises in resistless force (case of E.C., see Epileptic Insurity)-or a visual ballucination, in the form of some object of terror, may call forth these same results. The epileptic farer may be of some considerable duration, and the subject. remain in a dangerously homicidal state during its continuance; but subsequent to the paroxysis, the subject will remain either greatly hewildered (retaining only very partially some fragmentary resulbections of the attack), se, still more commonly, he wholly oblivious of the circumstances and of the conduct which he has just displayed.

In the masked epilepsy of older writers, we find that a fit of boulcidal mania may replace the convulsive secure (a convulsive idea, as Mandeley would say, taken prosession of the mind), and, without any of the usual epileptic phenomena preceding, a sudden irresistible mardeeous impulse (probably prompted by delusion or hall-scination) occurs; but here, again, the subject fails to recall any conception of his selious. So, likewise, in the dreamy state of epileptics, approaching the seminanthalistic condition, hemicidal acts have been committed in

a semi-unconscious automatic state of mind. It is automating how complicated may be the acts performed in these states by the epileptic automaton. A better illustration could not be found than that queted by Dt. Gowers, where a carman in this state of automatism, after an epileptic seizure, "drove through the most crowded parts of London without any object, but also without any accident."

The Amok of the Malays already reterred to (p. 210) is attributed, most plausibly, by Gilmore Ellis to masked epilepsy—alsoholic reductions being wholly out of question in view of the great aversion of the whole rare to alsohol.†

Genuine impulsive insasity, apart from grave mental derangement, however, is also occasionally seen in epileptic insasity; in the intervals between the convulsive seizures, certain patients are subject to frequent insane impulses to murder (without any motive or malice) any one with whom they are brought in contact. These conditions usually alternate with delesional states, and with the maniscal outbursts succeeding the epileptic attack—they are the most anxious cases to treat, and the most difficult patients to control. Such subjects are peculiarly susceptible to the effects of small quantities of alcohol, which may induce, even in very trivial amount, the most furious outbreak of mania, or the impulsive homicidal state alfuded to.

Alcoholic excess may induce the impulsive form of insanity in certain predisposed neurotic individuals; a condition of alcoholic delirium of extremely short duration (munia transitoria);, in which a mad impulse to murder prevails, may thus be induced by what in usually considered by no means immoderate dranking. The symptoms, however, embrace much mental confission, and the subject remains, after the attack is over, in a state very similar to an epileptic after an attack of petit mail.§ Amongst other chiological factors we must not

* Discours of the Neverns System, vol. 11, p. 601.

† See a most instructive article with cases on "The Arank of the Malays," by W. Gilmerr Elin, M.D., Singapour, Journ. of Musical Science, July, 1893.

"Manifely is and called course is asserting that many more of manus resembles are really instances of "montal epilopey."—On etc., p. 230.

On the subject of mania transitions Mindeley remarks — Although spilepsy, marked or overt, will, I think, be found to bout the bottom of most cases of samia transitoria, it must be admitted that there are some cases in which there is no evidence of optiopsy in any of its forms to be found; but it may well be doubted whether a distinct image sources is not always present in these cases. With such a constitutional presinguistion, a general sytack of scate imagin, lasting for a few issues only, or for a few days, may break out on the organize of a mitable exciting mass, and during the purchases buspons that a woman is most with a purcoyou of anits is most with a purcoyou of anits in standards, it constitutes happens that a woman is most with a purcoyou of anits mania of short duration, during which perhaps the belle has child without knowing what the is doing. The effect of alcohole intemperature upon a purson alcoholy predisposed to remarkly, or upon one whom a farmer attack.

fail to note the vicious agency of imitation which was originally emphasized by Esquirol, as one of the causes of this affection. Undoubtedly, the merbid excitement engendered by the perusal of records of criminal horrors, by the publicity afforded in our Assise Courts to the revolting details of crime, and, up to within the last few years, the demoralising effect of public executions have greatly fostered the development of these states of montal disease. If there is one fact in mental physiology more established than others, it is that the continuous direction of the mind to the sensual and purely nainced passions of our nature tends to intensify their potency-to render their channels of operation more pervious, and so to withdraw thou from the inhibitory control to which they should over be subject. The leutal instincts are still less protected in those persons of weak mind, who, not endowed with an average amount of controlling power, require but the intensification of such instinctive states to lead to explosive outbursts; in such cases mental steam, anxiety, ill-health, and other exhausting conditions, and especially alcoholic and sexual intemperance, may readily lead to uttacks of bunicidal mania at periods when the public mind is horrified by some startling crime.

The Suicidal Impulse,-What we have said respecting the bomicidal impulse applies in most particulars to the self-destructive propernity; it also arises in subjects who archibit no intellectual disturbance, and in whom the moral sense is intact, in so far, that they, recognising the horror of their situation, and the unnatural character of the morbid promptings, revolt against the perpetration of the act. Like the houseide, they may implore protection, and volunturily resign themselves to asplans supervision, dreading leat they may be overmastered by the suicidal impulse. So likewise dowe find the impulse of convalsive nature sudden in its orast, transient in its course, and followed by immediate and complete relief; inc analogy to the epileptic state being still further indicated by the occurrence of an sura, usually an aural hallucination. The condition to which we allude is, of course, not the ordinary spicial tendency of simple melancholia, where the morbid depression precedes and explains the negative suicidal state; but the condition where, from the first, the exicidal proposaity presents stoolf, any depression being secondary, and induced by the patient's helpless condition. The climacteric spech not unfrequently develops this impulsive form of insanity just as it does homicidal states; and a good illustrative case is detailed further on in our study of the insunity prevailing at this

has left predisposed to a second, is sometimes a dicert but some manus of endent character with total full standard and destructive traderics; and a like effect may be produced by powerful moral masses, sexual excitomoral, and other merogeneed causes of insuraty." (Eugenschilder) in Mastel Dieses, p. 1977.) period of life (see case of S. N.). Winslow records the statement of one patient in follows:—"For six months I have never had the idea of suicide, night or day, out of my mans. Wherever I go, an uniseen denson parases me, impelling me to self-destruction. My wife, friends, and children observe my latheaucess and perceive my despondency, but they know nothing of the worm that is guawing within."

The morbid impulses to which the instant are prese are as diverse as are the active tendencies of the mind riself; but many manifestations of an instructive character, on account of their obtrusive and criminal nature, have claimed special attention, and have been exalted for some authorities into distinct forms of instality; whereas, in truth, they should be merely regarded as symptoms or a group of symptoms (syndromes) which may occur in any loves of instality, and which, in particular characterise the mental alienations of the degenerate. Such are cases of kleptomania, pyromania, dipsomania, and erotomania, or the impulse towards theft, inconditation, drunkenness, and sexual autrage. A few remarks on these so-called obsessions may deserve a place here.

Kleptomania. - The essential character of this condition is, like that of all morbid, instinctive nets, more or less incontrollable, despite any resistance to its perpetration the subject may exert. It is not a more proponalty towards thicrish acts, such as classocterise so many forms of mannity; but, the idea of possessing what is not rightfully. theirs, attended often by great anxiety and terror last control be lost, becomes in itself the originating factor which determines the theft. The painful feeling proceding the crime vivielly portrays the lack of control and the cruel helpleanness of the victim, the intensity of the idea being the immediate promusor of the impulsive act. In general paralysis, the early stages are often characterized by thievish propensities, but the nature of the act is wholly different; the suppdity and awkwardness of the seed are in themselves sufficiently indicative of its being the outcome of dementia, just as are the other nocal lapses which appear in this disease (p. 267). In other forms of domentia and imberility, and in the confinemal reductions of epileptic insanity, the this wish act can usually be at once distinguished from the impulses of the kleptomaniae; yet, in spilepsy the genuine condition may also be revealed. In the latter case, it may be an imication of teassient reduction, in which, higher controlling centres being in abeyance, the secretal propensity springs irresutibly into activity; or it may be the success of personnel second fague from the continued progressive depadation of this disease.

What is all important for us to realise is the fact that just as by dustand processes (epilepsy), by toxic agencies (skokol), or again, by

^{* (}Borner Diemos of the Britis p. 265).

functional excesses (sexual), the volitional control is so paralysed, as to admit of over-action throughout the whole gamut of morbid propensition, so also in the degenerate organism, where inhibitory control have always been of rudimentary development, any of these pseudomoral lagons may betray themselves as gennine convelative or impulsive acts. Kleptomanis has been affirmed to be a frequent accompanishes of memorraal devangement and the late programs state.

Dipsomania.-The same features pertain to this condition; there is an all-powerful, irresistable tendency to drink, which appears after a more or less mental depression, vague sense of impending evil, and a general functional disturbance; it shows a paroxysmal or intermittent nature, and the debusch, often leading to the greatest excesses in other directions, is often followed by a keen sense of share and peritence, and also by an atter indifference or distaste for stimulants in the interval. Its rhythmic or paroxysmal recurrence appears to indicate nutrational anomalies as the basis for the morbid syndrone, and in most cases, there is unlegibled evidence forthcoming of a neurotic taint. In all cases the phenomena are alike; first, the observion or blea of drink, then the anguish aroused by the sense of volitional impotence; and lastly, the incontrollable impulse to drink. leading often to the most immoral, degrading, and victors conduct to source the inforients. In the facts that the taste for druk does not first occur, that, indeed, the victim often does not care for drink for its own sales, and that absolution does not namely lead to this disease, we at once perceive the distinction from ordinary cases of drunkenness. The sesential Sentures are, in short, the impotence of will before a crael obsession, the short but painful enraggle to resist, the impulsive outbreak, a merical ayadrone occurring in a degenerate subject whose inheritance has probably revealed itself throughout life in mental sustability, in general want of balance, and in the features which notably present themselves in all forms of the explosive psychoses.

Erotomania,—The same recorks apply almost is overy particular to conditions of crotomania, which embraces uscalled "matyrinsis" and "mysophomania," terms applied to the crotic impulses occurring respectively in the male and female subject. Satyrinia appears occurionally often cylindric discharges, claiming on this account appears attention at the hands of the medicopariat. Instances of persented sexuality, ugain, often include cases of true impulsive insunity, but the whole subject has received such special attention from Continental written that the reader may be referred to the columnous works of Lembroon, Konfft-Eling, Caspan, and others for further particulars.

Obsessions, Imperative or Dominant Ideas, ... When any one idea or group of bless insule the mind enter-pricelly to the exclusion of others, despite the affort of the will to suppress or eliminate the same, we speak of it as a dominant or imperative idea—an obsession. Such obsession may alone present itself, as an isolated fact, but it is usually the initial stage preceding irresistible immiss.

The effective capacity of the will rises and falls with the resistance presented to it—e.g., with the vivalence of the idea to be suppressed and we are well acquainted with conditions where the mortid vividence of the idea is such that the will is powerless to inhibit, although exercising its normal energy. In such a case, we cannot speak of the morbid syndrome of obsession and impulse as due to enfectionent or discuse of the will, but rather to an overpowering morbid tendency wholly disproportionate to the normal solitional activities of the subject. Obsession, or imperative ideas become, in this sense, a sort of mental monatrosity, and must be clearly distinguished from such phenomena as epileptic impulse, where genuine reductions have removed volutional control, with the result that instinctive actions spring instantly into life.

Such painful obsessions are smally found in the subjects of a neurotic beritage—ancestral epolepsy, alrededism, insunity or crime being most frequently traced. The degenerate offspring of a neuropathic stock becomes still more subject to such obsessions by agencies which tend to reduce the velitional control—alcoholic and sexual excesses in particular. The frequent and persistent direction of the attention to certain morbid ideas will also tend in the degenerate to establish such obsessions, and favour their relief by the corresponding impulsive ast. There is little doubt but that the morbid and repulsive countionalism of our Assise Courts, througed as they are by austable and degenerate individuals, largely fosters the tendency to the development of obsessions and the full minuting psychology, through mistirected imagination.

Amongst those most generally met with are the obscuious of fear and indecision. The fear may pertain to any person, place, object or relationship; the category of the things feared being limited only by the possibilities of existence. This merbid dread, however, pertains nearly uniformly to some definite object, and the innumerable terms invested to designate these mental states illustrate forcibly the abourdity of attempting the symptomatological classification of such mental manifestations. A fear of pollution by places and things; a fear of closed or open spaces; a dread of certain saimals; of the night of blood, known, poisons, explosives—are some of the more common, but the list neight he almost indefinitely extended.

The observiors of doubt again resembles that of Sear, having as an inter-distribut of self; e.g., there may be a tendency to review incremently over and over again one a own notices; to repeat again and again numerical calculations, to interpose repeatedly an incomprunts and wholly irrelevant word or phrase in the course of conver-

antion; or to enumerate over and over objects lying before his gaze. One notable case known to the writer would present herself a dozen times a day at a railway station, but never could persuade herself to undertake the short journey intended; in this case complete recovery was occurred.

Closely allied to the foregoing are the states where there is inability to rise, to walk, or to sit down (actain, abacia), and which have been closely studied by Continental writers in hysteric subjects. In these conditions, the will does not fall in its inhibitory capacity, as in restraining a morbid impulse, but it falls to initiate the action desired; such states are known as "absorbin," or "aboulie obsessions."

STATES OF MENTAL ENFEEBLEMENT.

Contents.—Montal Deprivation in Contradictionium to Developmental Assest—Persistent Exferblement—Chronic Residue of Asylum Communities—Secondarity of Manisoni and Melanchalle Forms—Consocitive Demontus—Decimient Insanty—General of Monomarinal States—Environmental Resistance—Transformation Completed—Mystic Symbolium Effective Cases of Debesions, Insanty—Monomaria of Pride (J.O., E.T.)—Religious Monomaria (J.E.)—Monomaria of Persecution—Progressive Systematical Insanty (Parama)—Transpy Implication—Systematicalium—Neuropathic Rasis—Secondary Systematical States—Typical Paprice-Neurotic Form—Folic & den.

Amongst states of mental enfortlement are comprised numerous widely different groups, which constitute the large bulk of our asylum communities, and in which the mental allment differs in its mode of origin, essential nature, and the characteristic features presented. The term mental "enfestioment" is perhaps the least objectionable which we may employ for the various groups comprised under this class of mental allments, but there is a sense in which its application is faulty. The term should, we think include states of mental deprivation only—i.e. states of arquired defect, whilst coapstited and developmental arrest would be more appropriately considered under a distinct category. Intoxy and imbecility would, therefore, be excluded from the class, which would, however, comprise the various forms of monomania, of chronic mania, and dementia.

All instances of mental reduction are, of course, amine of mental enfeetlement, and, therefore, in one sense, off cours of scatts immity are alike cases of mental referblement, as is the stage of susper follaring acute insanity, or an epileptic subburst. We do not however, extend to this term so wide a significance; we arbitrarily exclude states of fremient mental deprivation and limit to commutation to conditions of persistent enfeeblement, whether primary or consecutive in their origin. In lact, we comprise under it the incurable terminations of acute insanity—the chronic image readue which remains, as wrecks remain after the atorm; also, such cases of permanent enfeeblement, as are not preceded by acute mental symptoms, e.g., the "primary domentia" of organic disease of the brain—from morted growth, apoplectic foci, and cerebral remollisement—and the dementia of senile atrophy. Under the respective headings of colleptic, apoplectic or paralytic, senile, and alsoholic manities, we shall allode to the features presented by the mental decadence accompanying such affections; but we must here devote our attention to a consideration of consecutive dementia as a acquei to the acute forms of mental disease in general.

Number of Cases. 134 286 66 46 137	Maria Simple, Acuta Hystoric, Chronic, Dabascoul,	PROTEST			
		Rounnel	20st	Reitered.	themis .
		Beyoni 63-0 78-7 27-0	10 11 0	11 84 90 369 369	10 11-9 12-8 30-9 31-9
85 88 141	Rosserent, Pasrporal, Melancholis—Simple,	514 517 617	32 13-2 14-0	65 H4	90% 65 10%
SI 998 16- 11	Arute, Defusional. Bacturent, With Stagoe,	519 55-5 50-9 63-4	21.5 14.0 12.5 2.0	34 S 34 S 32 S	150 160 250 970
15 to 10 to	Demantia Secole, With Equitement, Depression Organic,	29:0 41:0 9:0	50-0 53-7 23-0 54-9	39.7 28.0 38.0	13 0 34 2 7 6 6 0
74 88 13 18	Epilepsy, General Paralysis, Inductity, Idinoy, Chronic Cercloul Astrophy,	ns	26-6 72-9 17-0 28-4 77-7	23-0 21-6 84-3 15-3 22-0	38 9 54 30 7 45 9
1806					

A glance at the preceding Table, which affords us the results of treatment in the case of 1,869 female patients admitted into the West Riding Asylum, will serve to indicate whence our chronic image immates are chiefly derived.

In the Table it will be observed that a large proportion of maniscal and neclarchely patients are discharged "relieved," and this class comprises a number of permanently especified minds, in which the acute symptoms having subsided, the subjects are unfely disposed of under the care and aspervision of their friends; hence the chronic remainder in our asylums do not represent by a long way the consecutive dementia of acute invarity. Bearing this fact in mind, one may still advantageously compare the total number of chronic cases remaining after manifest and archaeletic secures respectively—it is then found that out of 515 instances of all the forms of maxia, a percentage of 20 6 remain permanently proppled in mind; and that out of a total of 518 instances of melancholis, a percentage of 15 0 remain as a chronic residue.

This is what we might anticipate from our knewledge of the deeper reductions participate to the maniscal forms, and conformatory of it we note a progressively increased tendency to chronic exceediment, resulting in the acute, delinicani, and recurrent forms, as compared with the simple form of melancholis (end Table). If we summarise results for all forms of manis and unlancholis, we obtain the following:—

	Percentage		Tel-1	Chemin
	Recovered.	Died	"fishered."	Beninder:
Manucal forms,	58-2	119	14.0	30%
Melancholic _	67:1	14.6	129	1300

The more unfavourable character of manta depends upon the incarability of its delimional forms; the simple and arate maniscal selecters, if they do not bend to the delimional form, are invally of high recoverability, as indicated by our table; certain forms especially so, as the prespectal and hysterical. Were it not for the large proportion of such arute cases, the unfavourable nature of maniscal, as compared with the melancholic forms of insanity, would be strikingly obvious

Consecutive Dementia, -Ordinary consecutive dementia, nowever, presents us with a progressively advancing enfectionment of mind, a complete change in the disposition and character of the patient, a lack of interest in former pursuits and associations, an incapacity for any form of mental effort, a tendency to an automatic routine in the habita of life, and a notable blanting of the emotions. Maniscal or melancholic states accasionally return, and beimy, in a marked degree, the incoherence of thought and the enfeetdement of the mental faculties; hit, indusquent to such attacks, the mental weakness continues to advance, until it issues in complete fatnity. Yet we find great divercity in the progress of individual cases : in many, the advent of such a mental vaid, as we have just alloded to, only comes after a very penlanged life, during which they above no mental preturbations, but an spathy and indifferentian, a lack of instance which remiers topogvision necessary to provide them with the wants of life; others take a more penial interest in their surroundings, but yet are children in their actions, are decile and easily led, but subject to great instability if annoyed, in others, again, the brutalleing of their nature is since apparent-degraded liabits come to the front, vicious tendencies are

apparent, but conduct is wholly devoid of all intelligent direction or rational initiative. Many of these chronic demants are utterly buy, distinctional for any form of exercises, and manot be induced to employ themselves at the simplest manual labour. They will stand about for hours, slovenly and disorderly in attire, fumbling with their fingers, discreanging or tearing their clothing, and attering continuously a string of incoherent gibberial. Some of these subjects may have no delusion apparent, in a rule; but you at times, a mild maniscal attack may reveal some delirious conception, which again fades away as the excitament attack. The expressioniess features better the lifetonness of mind; or a fixed, hideous grimsce, or unmeasing supern, its unreason.

It would not serve our purpose here to attempt any classification of such numerous and incongrueus types as are presented by the cases of chronic enfoshlement amongst the insane; they can only be studied by prolonged clinical observation in the wards of an asylum. Grieninger has, however, distinguished between the class of excitable and that of apathetic dements, and to his viviá delineation of these types we would direct the student's attention.* They represent but different depths of reduction, the former being allied to mania—in fact, retaining a certain degree of its mobility as relies of the maniatal condition; the latter being the more profound reduction, in which singgishness of mind verges upon absolute fatnity. We shall revert to the morbid evolution of these phases of dementia in our section on the morbid histology of the-brain.

The transition from scute imaging is by no means always a direct transition to these forms of mental enfectblement—an intermediate stage of peculiar chronicity often precedes the more profound dementing which we have just considered. To these forms of monomania or delusional insanity proper, we must now revert.

Definitional Insanity.—We have spoken of maniacal states as presenting as with reductions to a stage lower than that attained by scalarcholic states; and we now come to a group of cases compelsing symptoms wholly distinct from those presented to us by the foregoing. This third group lies, so to speak, in the order of dissolutions, on the border-land between the two former. In the first (mania), we noted the general exalination and the free translation into action; in the second (melancholis), we observed the rise of painful feeling associated with general depression and restricted activity; in the third we find, as often as not, an emotional indifferentiam allied with false beliefs of an exalted stamp—a calm, which is, however, ever ready to pass into states of transient excitement, on the one hand, or into gloom and despondency on the other. This third group comprises the so-called

^{*} On. of pp. 300345.

states of monomania. Monomania as a morbid entity must be regarded as a state ecoloni out of melanchelic and maniscal perversions as a special derivative of these conditions, and as one of the terminations in chronic insanity. It can be audied to the greatest advantage in association with the preceding forms; nor is it possible correctly to appreciate its significance, if we have not previously analyzed the forms of melancholic and maniscal perversions.

Genesis of Monomaniacal States. - We have seen that a special feature of maniscal states is the hurry and tunult of the process, and the prevalence of delusive conceptions of a fleeting nature. It is this very rapidity of the cerebral process which accounts for the transient nature of such falsifications; time is required, a certain persistence of impression, or a frequent repetition of the same impression, to form any indelible stamp upon the memory. As stated, one delinton chases another out of the mind in the tamultuous superficial hurry of the manuscal state. The welling-up of feeling, which we have spoken of as the rise in subject-consciousness, finds easy vest in mania in rapid ideation, increase partialty, and artive movement; set all maniace obtain at times full relief in active ideation alone-for the manuacal subject need not be at all times restless, nor need he be garralous-yet his expression will indicate to us the varying meeds and rapid process of incoherent thought going on within. We speak securionally, but incorrectly, of such cales as instances of suppressed mania-there is no mental tension, but complete relief in the active identional process. Monomoniacal states are essentially those where the rise in subject-consciousness dies not lend to easily as current across, but rather to find relief in forms of perverted ideation; and herein lies the distinction between the two forms-in monomania these is no longer emotional exaltation and lummit, but perfect calse; the false conceptions arising at these levels of reduction have a far more serious import, since the existing conditions favour their finity. There rise more definitely and more freeldy into containment.

The turbulence of the intellectual life in manua and the heightened mental refer, we have associated with spaces of the cerebral atteriales, and the resultant quickened circulation in the corebral restent, in manuscription states, a quiescence of the coreolatery current appears coval with the declim of such scaled cerebral reduction, and we approach the stage of melascholic reflections except for the absence of vanishes of a feeling of restricted translation from emotional to intellectual residue, the feeling of freezions and power still predominates. Such freezions, as before stated, finds its output in phases of abstrant idention.

And yet there are times when the monomoniae realises somewhat

painfully a sense of environmental resistance-a sense which must be generated whenever he attempts to put his impossible schemes into practical operation, or tries to convince others of the logicity of his absurd speculations and belief. Especially, however, does this sense of resistance make its appearance in cases of fully-developed monomania, where languor of circulation, induced by cardiac enfeeblement and exhausting affections, such as phthisis, reproduces the melancholic phase afresh. This sense of outward hostility—the irritation and excitoment thereby engendered-is a more prominent feature in the ewriter stage of monomania; and in most cases it is found, in some one or other form, at this period of the disease, as the natural outcome of the antagonism which the subject must recognise as existing between his heliefs and the circumstances around him. It is a feature which indicates the incomplete severance of this affection from the purely As the mania mibrides and calm succeeds as the maniacal form. egoistic feelings predominate more and more, and obtain more complete. accerdancy over the intellectual life, the transformation slowly, but elaborately, undergone by the personality is in itself a sufficient answer to all outward antagonism; the all-sufficiency of the new ego, with its wondrous powers, capabilities, and motives for action, dissipates all apparent opposition, or ignores its existence.

It is thus that we find our patients at first, in the early transitionperiod between mania and monomania, intolerant of contradiction—no opposition offered to their defunive attenuous fails to arouse passionale outbursts, violent abuse, and even vindictive conduct; he who risks this often wins for himself the open and long-continued hostility of the patient, at no time a justifiable or politic procedure. At this stage, the deluded subject is loadly ameritive of his beliefs, and actively aggressive in his endeavours to carry them into practical operation; in interminable writings, in incomant declaration he will assert his newly-acquired prerogatives; whilst soute hallocinations frequently occur at this period, leading fresh intensity to the drams which he enacts.

In the more confirmed value of a later stage, a love of mystic symbolism is almost invariably apparent; the monomarise will point to some common-place picture on the wall, expatiating on its secret meaning; he will assume some factuatic budge as the emblem of his evalued dignity—spiritual or temporal; by factuatic gestures or significant movements of the head he will express some meaning hidden from all except himself; or by uncouth arrawls, or geometric devices, he will symbolise Scriptural truths, Biblical records, or accentific discoveries. By such means emiliantly discovined, the subjects of monomania beguie their time, and form meanwhile prominent characters in all anylum communities. Their load threats, their lody

denunciations, their fulminating proclamations, contrast strangely with these improcesses in action. They live in an ideal, not a real, world; and are estimated to the full by the mere semblance of authority and power which such expressions conjure up. On this account they are rarely violent or dangerous; they are ruled with the greatest facility, requiring only fact upon the part of the name to transform them into most useful and willing helping hands at various suployments. Thus we see the patriarch and delegate of the Deity (J. O.) actively at work in the bookbinder's shop of the West Riding Asylum; the Empress of Hermon (E. P.) busily plying the needle, triuming the patient's bonnets in the workroom; the "Saviour of mankind" (J. E.) taking an active part in the densetic arrangements of her ward; and a notorious admiral who formerly ruled the sear in days gone by, contentedly framing pictures in the joiner's shop.

Case of Monamania.

In the following case of J. O. we see the subject pass through the transition-period from manis to genuine monoments; his case force a good illustration of the mystic symbolism in which these patients, as we have said above, so frequently indulge:—

J. O., formerly a prison warder in South Wales, has been resident at the West Belling Asylam for nearly non-years. When first admitted be was thirty-atyears of age, a well-contribed tean of medium beight, and from from any buildy allments. His wife had long recognised his mental failure, but marineal exercement had now compelled her to place him under swarning. He was at that time, undoubtodly; the subject of fixed debutons; "all former agencies were in languaagainst him, and there was a comparacy to high quarters to damage him." He had written to the priors containsoners repeatedly about these plots, and was at that time writing a book on " lieligion." He talked much about surious instruments by had invented, especially "on air and water engine, requiring no boiler," for which he was about to obtain a potent. His condition at this time, and during the following twelve months, was much mixed up with maniaral excitement-in fact, it was the transition-period to typical monomenia. During this period he was often bortile. most unsociable, and utterly indebut; had an arrogant, overleaving demonstrate stalked up and down the wards as though in a position of anthority, and grew argey at the most triffing opposition. He was usually retirent, but constraintly talked upon the subject of his inventions and of his experiments upon lightness, which he had conducted "by holding pinous of various metals in his hard during a thunderstorm." He then commenced working on the farm, but would spend most of his space time reading his Bible-making many differently shaped spound out al hits of wood, straw, &n., often carrying one in his hand. He declares that he was strugglally out here; that he is deputy-presence of a good, and possesses the warrant of his appointment; and that he has made namerous discoveries in electricity and magnetism. Since this period be has been regularly employed in the bookbinder's sleep, where he is a useful and industrious worker; he is an intelligent workman, and is calle and consistent in his behaviour at all times, currenally betraying no evidence of the profoundly delusers state under which he labours. He regards himself as a patriarch of the church, seel as the appointed of

God to denounce judgments against all avil-doors. Fooling his confinement here inconsistent with those views, he applies to all the crowned books of Europe for americans against the personalisms of the medical profession, of when the writer in the arch trainer. He weren demonstrately letters to the medical superintershoot, calling upon his less the curse of the Alenghty, and sends him, every track or so, a per and ink confine sketch of a coffin, as a last warring, after ancompanied by the words, "Behold thy doors," addressing his ministrat, "To all whom it may consern," or "Let this find its owner, "with some similar suggestive exempts much Occasionally his letters to the medical staff tre lengthy and argumentative, finely interspected with summers tests, or Scriptonal references, containing also words of schordation and streaming often distanted in the style of the New Yestamust switings; but it is more usual to find them full of force decumnation and threats of divine judgment, or e.g., the following:—

11 Hough, 1887.

"PROPERTY ENGLISHED OF BELLINGS.

⁹ L as English term subject, J. D., here in the County of Yorkshire, near Hafsberdield, Do hereby substudy declars in the name of 'God,' the Almighty, the Supremo and Invisible Spirit, and pronounce through Blie Almighty authority, Bis dimensible curses and judgments upon you, and your supposed and monifed Oracious Supersign and all her subjects, both spiritual and temporal, to this my intercretion in this Asylom or any other.

"J. O., lute of Hallian."

In the following case we have a remarkable instance of the transformation into the measuremiscal state upon the occurrence of epileptic seizures:—

J. B. was admitted at the age of forty-two years in an acutely melanchally state. She was of slight build, thin, reduced and assemic, having been in freble health. time her last confinement, twelve musths before. She was not known to be an epileptic. At this period she was greatly distremed by sural hallaciastions, and when at home the previous day had heard people meeting about hemsath the floor of the room this occupied, shirpening knives and saws to murder herself and family; all night long she heard her child trying distressingly on the staircase, and man acraptag at the walls of lare bodroom. She was firmly convinced that her soul was elemally but-could see no soupe from destruction, and under these impressions she made several desperate attempts at strangulation. She related final seed meetining most possistently, and nonsed herself of every form of iniquity. This despendency continued for some six months, when the potient had a series of spileptio fits, the character of which was not soled at the time; but now an satiss charge was inaugurated in her mental life-the depression abated, and she assumed a cheerful aspect; took as interse interest in all anomal her, and became an active and valued ward help. The spileptic seitness have recurred over since, but invariable at night, and with very long intervals, after of yours, between the articles. For many years the has been a typical enumple of religious immemaria. The fits she believes are caused by the "working of the spirit-which has been working very powerfully upon her for some time-because the Fatherhas thought proper that she should bear if for the salvetion of the world." She is still in delicate health, and suffers considerably at times from migraine. Always smiling and shourful, affable with all alike, she is a great favourity in her ward; all who are hought into contact with her mo, she believes, such eternally happy

through her instrumentality. She is still in tides a sufferer—a Christian martyr.

"She came here because she thought she had to mave all the world. She knows
that Christ died to mave sinners, but feels that God has given her that power.

She thinks that if persons touch lier it flow them good, and soom them. All who
have come here have come through her, and she feels responsible for them. If
all their scale seet on her, what as account she will have to give at the day of
judgment! She cannot sleep at times because the 'spirit keeps working in her
like quick-obser."

Thus all former painful scental states have been sublimated into this higher ideal existence. She still answers to her former name, but her personality is, as we see, completely transformed. At times she will state that she feels sho in Jesus Christ, that she existed before the foundation of the world, and will cite scriptural passages referring to the Messiah, as applicable to herself. She "lowes everybody in the world," and during the evening is often found at the window singing sloud, "Hold the fort, for I am country," in shell accents, with the object, as she says, of "belging these cultude." She has a gentle, quiet, including the manner, has the sweetest disposition, spends much of her time perusing her Bible, and is often found scated mutting, with her hands crossed upon her breast, and an expression of peacetal resignation stirred trie beaming animation when she is addressed.

E.T., aged bety its years. This patient, who it a married woman, the mother of six children (the youngest been four years prior to ber advances suts the asylum), was then suffering from her first attack of insurity of a few weeks' duration celly. She had been confined to bed for twelve months, suffering from brombitis and emphyseus, and troubles incidental to the climacteric period.

The history of her case was me of depression, groundless fears, and delasions of suspictor become against her family, who also independ compiled to prices her; under the influence of these fours she obtained yesfund food, and passed restless nights, atting up in hed continually praying.

She was regarded as at the climaterie. Family history devoid of neurotic tains. On administer the was extremely this and wasted. She is short of storars, bony, and of a somewhat massaline type; she has light blue eyes, a sharp penetrating glance, and a suspicious demonsor. States that her knoband, daughter, and neighbours hive compared to temove her from her home, that her daughter has the power of witcheroit, and can appear is viction forms; that her family and neighbours attendes saliva and other degrating matter into her food; and that she has been given gold dust and surpents to evallow. She stoutly maintains these statements, and declares that on the previous right she believed herself to be in labour of serpents. She hears her see and daughter whispering through the wall, and addressing her by lost and advance masses. No visual hallocantisms are at present obscure. The physical extramation revealed general isometritic with emphysican, but no committation or evidence of imaginat phthisis, such as her appearance engagested.

Steady improvement recurred in her case, her deliminal fided away, and within a mouth she was regarded as convenienced. Then occurred a endden relapse, in which monitoid continues replaced the former moutal deposition, and a downward curren of smotal reductions has caused unchecked ever since. Her general health underwest marked improvement, but she always remained pale and assemb. Her excitement was sharacterised by load, abserve, and biaspiresous language to all around fier, and by a hostile demander and threats of violence to those who

approached. Little or no abanement of her accitement took place under treatment by sweezs conti, bromids, with Indian homp, opium, or hypocyamins. Her concities, during the five years succeeding the omet of attack, was that of typical concernation. She would not included from other patients in a recess before a window, choosing a position where a portrait of one of the Bayal Princes lung apposite her. Here, decorated in funtastic attace, her hair adarmed with feathers, columned ribbons, or muck diadens, and her done decreated with referred devices, all alwhich had some agestic symbolism to herself, she would not in state, the embodiment of pride and anyoganes. From hence she issued her annalates to the world around, or met those who approached her with scomful defant gaze, together with a terrent of lafty abuse and imperative orders to withdraw from her presence. Occasionally the would disign to expetiate on her lefty rank, would point to the portrait of the years. Prince, and speak of herself as the Empreus-his mother. Her conversation was now very inchescul at times, but was invariable tinetured. by her grandless definition. She frequently complained of sudden sharp pain in the side, which she attributed to having been shot there by the medical officer. On one committee she was beard to either a load piercing shrink, and was observed, transitual with horror, gueing at, and pointing to, an imagined traguly, which was being vividly marted before her ... "See ! see !" she cried, "they have the hade in tim-look at the blood;" then she fell black in her chair and laughed with deriaine laughter.

Ton years after her admission her habita are noted as similar, and the mental features as emiltoned.

Twelve senith later, reidence of phthics was revealed, and a slight attack of homophysic occurred. She complained of pain in the lower dural region, and asserted that "that part of my spine has been out out, and made into jelly; all parts of my body have been made into jully and thrown on the floor; I've been a dactor 300 years."

Latterly, she has broken down rengictely in health; pitthineal symptoms have been for more time prominent, and constitual homophysis has countred. Completely bed-ridded, and a great sufferer from amountations of her chest symptoms, another prostrated in health, palled and emarkated, she still amonth her royal povequative, and insists upon being addressed by her locally title; she issues her mandates to her tourisers, princes, and statemen, with gostures of mock authority; and still, at times, becomes inste at the least appearance of opposition. There is now complexable neutral enfeshiouser; increasing insoherence of ideas, and a tendency to substitute passessing woods, and interpolate them in her sentences so that they constitute at times a confused and unintelligible jargon. She is now tractable and devoid of all the repollant features characterising the early stage of her allocation—anniable, as a rule, but still subject to mild enthurs of unitability and excitoment, in which her debaseousl position become very possitions.

Both these cases, we charry, are of many years' standing; in face, managements in a most charmic form of invanity, gradual in its inception, and very slowly progressing towards general mental enfectionent; the scherouse of former associations becomes associated by whilst the feltitious personality persons and erects itself skeleton-like amidst the rains of mind.

Progressive Systematised Insanity (Paranola).—The clinical features which first appear to have suggested the constitution of a distinct morbid entity to which the terms "Verrucktheit, "primare

Verrucksheit," "Progressive Systematised Insanity" were applied were :-

(a) A Primary Implication on

(6) A Neuropathic Basis;

(c) A Systematised Delusional Perversion with

(d) Progressive Mental Enfoeblement and Incurability.

What value rught to be assigned to each of these terms in the constitution of a nonological sortity! Let us endeavour to weigh their significance for purposes of classification.

Primary Implication. - By this torm is implied a specialised insanity or one not preceded by a generalized insanity, such as mania te melancholia; in other words, a primary alteration not based upon on affective discreter; an alienation gradually evolved, in which the earliest symptoms may be most obscure and indefinite, but eventually culminating in complete intellectual downfall. With regard to the value of this feature, it may be stated that, whilst all forms of insunity appear to be preceded by more or less affective disorder, the intensity of such emotional disturbance varies with each case in every possible degree; so that it is difficult, may impossible, in many cases to state whether the insunity was truly primary in this sense, or secondary to an affective disturbance. Taking also into consideration the doubt so often introduced by want of observation, or by lack of intelligence on the part of the friends, we see still more inclined to assume that a somewhat arbitrary value has been assigned to this feature for purposes of classification.

Professors Wille and Meynert both affirm that there are not many cases in which it is difficult to determine, in the early stage, whether they belong to primare Verrocktheit, or to melancholia (Hack Table).

Since the days of Griesinger, who emphatically declared that emotional disorder always preceded systematized invanity—that the latter was always accordary—German alignists have shown a complete charge of front, and now amuscribe largely to the opinion long held by Preach authors as to the saintence of a Primary Verrackheit.

From what has already been stated by us as to the all-prevalent feature at the onset of mental disease (p. 153) it must be inferred that a disorder of feeling psycholes and accompanies all forms of instally; and that a primary implication of the intellect, strictly as to speak, cannot be logically assumed to exist. In all such cases as are quoted as types of primary systematical instally we note the affective disorder in early stages and throughout the disease; the metancholic gloom, or other disorder of feeling, from the carried days may be saild and, as it were, drawn-out fine, yet this inabtrusive character does not warrant us in asserting that the morbid syndrome has not been evalved out of the moral nature.

Systematised Delusional Perversion .- Here again the value of a systematized process for differential groupings appears to be open to question, since systematization is a feature prevalent in almost all progressive forms of mental alienation-i.e., where emotional storms are in abeyance. It is essential to the satahlishment of a systematised initiality-to the evolution of, eg., that extraordinary morbid development we know as monomini-that the morbid process should work to its destined end in an atmosphere of comparative calm; in fart, all progressive insanities, if not accompanied by much tomult or usute disturbance, tend towards systematisation. At all periods of life, in early youth, during adolescence, middle life, and even in sentlity we may frequently truce this tendency to systematication—such seems to depend upon the absence of emotional turnoil. This insistence upon the systematised meture of the insunity appears to us, therefore, as a simple statement over again of the well-recognised fact, that in all morbid reductions of the moutal life the interpenetration of the morbid factor is favoured by smotional calm; that whenever a merbid process involves the intellectual element of mind, it is clear, defined, and more systematized—the less the perturbation of feeling and emotion. This is but a primary fact in psychophysics, and a part of the natural history of insanity in its consults, but scarcely seems to warrant the position assigned it as the resential feature of a specific entity. When the psychologist tells as that the more there is of feeling the less there is of cognition, and vice word, he expresses the law which is the basis of all systematised psychoses; the greater the emotional turnoil, the fewer and more unsubstantial are the possible coherences established in the intellectual sphere, and, therefore, the more dissoluble and transient the delutive concepts. Systematication in mental disease has, therefore, for us a far more general value, and cannot thus forcibly be dotached as the prevailing feature of any one artificially constituted symboms.

The Neuropathic Basis.—Here again appeal is made to a very general accompaniment of insanity, not necessarily of the ac-called systematical groups. Its value here seems to us chiefly to depend on the explanation it affords of the pathogenesis of the ac-called Primary Insanities, as affering an explanation of the gradual conset without acute or generalized symptoms. Our views on this point have been given upon a former occasion, and we shall here energy quote the opinious than arrived at:—We held that there was so form of mental derangement which had not some degree of affective disorder as its accompaniment; that a certain section of the degenerative class had arrived at a level—through former parental enotional starce—at which any accable affective disorder was in most instances no longer possible; that what was termed "Parancia" was simply definional inventy

engrafted on a degenerative or psychopathic basis; that there were reasons for believing that systematisation depends namely upon the incidence of insanity spon a psychopathic subject, and that too much emphasis has been bestowed upon it as a differential feature in the various forms of insanity.*

Referring to cases of criminal parameter we have showhere stated that it "is open to suggestion that such subjects are at the least the relics of a pearetic ancestry in which the more scale atoms of disease, to wit—acute alcoholism, consulsive epilepsy, impulsive forms of insanity, &c., have already passed over the parental stock, whilst the later stages of such nervous affections betray themselves in the mental enfectionant of their progeny.) In this particular it is gratifying to find our views in complete accord with those of Italian allenists.

If there be any excuse for the use of the term "parameta" as a synonym for "Verrucktheit" and as committing a group of primary systematised insanities, there certainly can be note for so-called "Secondary Paramete," which would embrace all systematised delusional insanities evolved out of a generalised insanity—and which does violence to the prime characteristics of the discous known as paramois—viz., the primary mode of tener of the psychosis. These forms of delusional insanity have long been studied by English authorities; they have been spoken of as rare by Mendel, and, according to Regis, have scarcely been studied at all in France.

Just as unmeaning and illegical then becomes the term "Asa's Paranoia," by which is implied a transient systematised insanity, of a curable nature, and the existence of which has been desired by Tanzi and Riva, Kraffe-Ebing, and others. French authors have wisely abstained from recognizing its existence, since the usual implication of the term "paranoia" would negative its possible occurrence. It appears to us, therefore, that we might with far greater consistency limit the term "paranoia" (if it is indeed necessary to retain it) to what has been described by the Italian School as degenerative paranoia and the primary psycho-neurotic form, eliminating altogether the so-called acute and secondary paranoias.

The term "paranoin" is ill-chosen and, etymologically, has not the significance of that far better term which it tends to displace—"primare Verrucktheit," or primary systematiced instally; these latter at least have the merit of defining the disease implied, whilst the former has led to still greater confusion than previously existed, and appears to have been introduced to avoid the awkward implication of primary attached indelibly to the term "Verrucktheit"; it has led also to the

^{*} Brit. Mod. Journ. (Mosting of Psychological Soc.), August 20th, 1892.

^{† &}quot;The Origins of Crime" (Formightly Review, September, 1950).
* Mental Dissam by Regio, translation by Bosonster, p. 166.

subdivision into numerous groups of questionable value of the classical "delusional insanity" of English authorities.

Our own view is in favour of selectiviting for these terms-

- (a) Primary systematised insanity of the degenerate.
- (b) Typical primary systematised intanity (i.e., psycho-neurotic);

yet always with the provise that the term "primary" may not be held as strictly correct or even jumificate, implying merely a proportionabely mild emotional reaction in the one case, and, in the former case, that the original acute psychosis is still to be traced in the accentry a view also accepted by the Italian school of psychiatry.

We shall describe in detail here only the typical primary systemstised instally :-

Typical Systematised Insanity (Psycho-neurotic). — The evaluation of a typical case of progressive systematised insanity presents three stages of varying duration—(a) Hypochondrisats with suspicion; (b) Perseentory insanity; (c) Transformation of the personal identity.

- (a) The subject in this early stage betrays a notable hypochondrissis, a self-analytic tendency, in which the victim refers all his troubles to some outside agency. All his feelings—bodily and mental—are subjected to a rigid self-analytic process; trivialities are exaggerated to undue dimensions; bodily sensations are criticised with a morbid intensity; his ideas and mental faculties all appear to have undergone some peculiar and mysterious change; his anvironment boks altered, and he reads in the gestures, looks, signs, and words of those around him a special reference to himself. With this weakening of object-consciousness and intensified squara, suspicion of the environment grows apace, depression and gloom supervine, reticence and brooding indicate the gathering district and hostility to the outer world.
- (b) Hallindrations, almost invariably soral, now appear upon the scene; smell, taste, tactile and general semation may all he involved; but visual hallusinations are remarkable by their absence. The hallusinations of hearing may be unilateral, bilateral, or antagonistic—the "epignstric voice" may be heard, or his thoughts be repeated andibly within his beain, and any of the varied forms of hallucinations, including the sexual already described, may prevail; in all cases they suggest the malign and hostile character of his environment. Not only does he find his thoughts school within him, but also his most secret feelings are known to and reflected by those around him. Some mysterious power seems to have gained access to his mind, regulates his mental life, onelayes his will and speech, so that he is driven to think and ofter ideas not his own. Electricity, galranitys, hypnotism, telephonic, telepathic, and other agencies are evalued to explain these

mysterious powers exerted over him by his enemies; and elaborate sketches are often drafted which detail to his satisfaction the methods whereby he is subjected to such torsure. The numerous phases presented by the several forms of manuscanianal percention all betray the same progressive systematisation of the delusive concepts; the prevailing heatility of the environment and resultant distrust; and, finally, lead to the climax in the third stage, viz.:—

(c) A transformation of the personality which is introduced by mystic and symbolic references, by the creation of unmeaning words (molegisms) to express what they otherwise cannot convey; and the final spothecess of the mind into the vagaries of ambitious insanity.

We have here described what is regarded as a typical case of so-called "paranola" or primary systematised intuity; it will be apparent to all who have rend the preceding chapters on Mental Depression, Eculiation, and Enfectionent that the features now presented are those which characterise all forms of persistent delissional innuity or nonomanical perversion. Degenerative paratols is, therefore, nothing more than deluzional insanity arising in a degenerate subject, and consequently stamped with peculiarities which more or less prevail in all the psychoses of the degenerate. Psycho-neurolic purarrota is the typical course pursued by all definional insanities; whether as the outcome of a generalised instaits, or whether it be not. is a mere accident, and apparently of little moment as regards the ultimate course and more of the case. A systematised insanity absolutely identical in all its stages with that just described is by no means of rare occurrence as the outcome of adolescent numia; similarly also of alcoholic immurity; both would be held to be genuine cases of secondary systematised inamity—not a partial but a generalised insanity.

Folle à deux,—Systematised delinional imanity is the farm which, far more frequently than any other, appears to give rise to accalled "communicated insunity" or Folle à deux; a condition where intimate association between an imane and a sans individual leads to a similar montal disturbance in the latter. The absence of soute, generalised mental disturbance, the color reasoning insunity, the systematised character of the delasive telicis, and their steady and gradual evolution, all tend insidiously to produce their murbid effects upon the mind of a strongly neurotic subject, closely associated either by ties of relationship or an compution with the alien. The malady thus aroused is usually identical in nature, and exactly similar delusive concepts become manifest unless such association be discentinued. The offspring of a highly neurotic stock may thus show in adult life the around, first in the one, then in the second, third or more, of a similar systematised insunity; or a deluded husband may arouse the same

form of discoder in a neurotic wife, or vice versal. Where arreral members of the same family are affected, and the malady is similar in character, we must by no means consists that they are necessarily instances of Folic & deax; we must carefully distinguish between direct transmission from a neurotic stock, and the mortial effects of association betwint individual members of the family. In fact, it is only when it has been clearly shown that there is a direct morbid influence of the one upon the other, that intimate association has existed, and that evolution of symptoms pursues the same course in both individuals, we can reasonably sassue a psychic infection. When individuals not related by community, but otherwise closely associated, betray a similar delunional instairy, aroused upon a psychopathic hant, we may regard the case as strongly suggestive of Polic & deax : yet, no hasty conclusion shanfal be arrived at, even here, since much may be attributable to identical conditions of life, corresponding lines of feeling and sentiment, and, especially, similar morbid or visious habits, in neurotic anbiects.

That the fear of such developments is but a remate one, even in the opinion of those who fully recognise the unintence of this inhibity, is sufficiently evident in the promisenous association of the subjects of systematised inscribe with all classes of the community in our large acylanes. Whatever plea has been advanced for suggestion of different classes of the insure, certainly that which has received the least emphasis has been the plea for the avoidance of communicated insurely through too promiseness association.

RECURRENT INSANITY.

Contents.—Definition—Ratablishment of Labels Equilibrium—Prevalence at Sevent Demaleure—Handlity—Inflament of Neuroine Heritage and of Associated Interpretation—Attenue.—Recurrence in the Computation Defective Subject—Meriad Excitement and the Moral Inductio—Attenuations of Excitement and Steper—Ripsteria and Measternal Interpolating—Frederical (A. S.)—Returnation in Additionates (M. C. III.)—Recurrence at the Characteric (II. O.)—at the Smills Epoch (I. S.)—in Passperal Subjects (M. R.)—in Transmitis Insurity (B. L.)—Morbid Impulsiveness—Hallocianium and Debuses (J. B.)—Creatic Insurity—Proposite—Treatment.

All forms of insanity are prone to recur; from winterer source the unstable condition of the nervous centres is derived, whether from substited neutratic tendencies, acquired vices, or physical nilments, all alike (even the most recoverable forms) have such a predisposition, intensified by the occurrence of an attack. It is a general law that the more frequently a centre sincharges its energy, the more sensitive to excitation becomes the mechanism, and the more reasily the discharge repeats itself. Hence, the extensive certical discharges which account for the reductions of insanity will, even in the most complete recoveries, tend to foster a similar hyper-semitiveness, and a labile equilibrium of the parts previously involved.

By recurrent insanity we mean a type of mental disturbance in which there is an establishment of this labile equilibrium; and the conditions under which such recurrence is brought about, together with the essential nature of the situal, form the subject of our inquiry. In the first place, it must be remembered that a neurotic inheritance, however strong, does not accessorily result in recurrent insunity; and, in the next place, it should be noted that simple relapses of insunity, which may occur at different periods throughout life, do not imply the sametonce of the neurotic type here alluded to as recurrent insunity.

Becurrence, with long intervals of repose, is not the characteristic of this type, but rather the rapid succession of attacks, each followed by an apparent complete convalencence. "Nothwithstanding the authentic instances of recurrent insunity showing intervals of lucidity for very long periods, so that the disease is known to be dermant for years, it is by no means to be inferred that every case that is a second attack belongs to such a category" (Sunkey).* A large section of the insure community is, therefore, constituted by these unfortunate ones, who pass many years of their life between an asylum and their home during frequent alternations of smitty and insunity. Those not conversant with statistics of insunity have but a faint notion of the sitestable existence of such victims. The following scheme of some fifty senserent cases amongst women will exhibit this fact in a striking manner.

When dealing with the ineasity incident to the periods of puberty and adolescence, it will be seen that recurrences are not frequent in the proper acceptation of the term; up to the stage of complete convalencence relapses are peculiarly prone to occur, but, once the cure is complete, a recurrence of insanity is not frequent, stateen instances only of a third or fourth attack being given in 277 cases.

Recurrent forms of insanty are far more prevalent in adult life, and increase gradually towards the decline of manhood and womanhood. In men, quite one half the cases of recurrent insanity occur after forty years of age; and out of a total of 66 individuals as affected, 49 had passed their thirtieth year of life; similarly in women, we find that usually half the cases cover the period of life between forty and fifty-five, which may be safely taken as the limit of the climacteric period. In fact, the period of life between forty and sixty years in the female is peculiarly susceptible to this form of mental derangement, being the period involved in sexual decadence and the advance of semility. In man this feature is not so apparent, there being other influences, as we shall use later on, which tend to beget in him such recurrent attacks at a somewhat earlier period of life.

^{*} Lectures on Meural Dieses, p. 178.

Table or Penale Recognism.

Similar of	the Age of	Sepressing Services	Number of Amotor.	the Age of	Representative of
8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	16 and 20 ps. 17	16 No. of the state of the stat	Second Se	11 and 36 yes. 22 . 48 23 . 45 23 . 45 23 . 57 23 . 57 23 . 30 23 . 30 25 . 31 26 . 30 27 . 38 28 30 28 30 29 45 29 45 29 45 29 45 29 45 29 30 20 30 21 . 32 22 . 30 23 35 24 35 25 35 26 30 27 35 28 36 39 35 31 34 32 35 33 36 34 35 35 35 36 36 37 38 38 38 39 31 31 32 32 33 33 34 34 35 35 35 36 36 37 38 38 38 39 38 30 30 30 30 31 32 33 35 34 35 35 36 36 36 37 37 38 38 39 30 30 30 31 32 32 33 33 34 34 35 35 36 36 36 37 37 38 38 39 38 30 30 31 32 32 33 33 34 34 35 35 36 36 37 37 38 38 38 39 30	578. 16 10 4 13 17 1 2 2 18 5 17 10 11 15 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

RESPECTIVE ACE IN QUINQUESTICAL PERSONS, IN 164 Casco or RECEMBERT DESCRIPT.

Age	Meles	Tension
Up to 25 years.	10	9
30	2	8 9
H 25 H		9
" 45 "	7	8 21
80	2	
	- 5	13
. 60	1	1 1
20		2
n 39 n	-	1 1
	66	-51

Who are the subjects most liable to this form of mental disturbance? They have a strongly stamped hereditary history of insanity; the parentage, when facts are procurable, revealing attacks of insanity often along both paternal and maternal lines. It is also notable, that is a large proportion of cases, we find the history of ancestral insanity attached to the grandparents, or the collisteral line of uncles and aunts, significant of a soore remote origin for the neurosis. The actual proportion of cases revealing strongly marked hereditary features often involving several members of the subject's ancestry) amounts to 26 per cent.; but, in 12-5 per cent. only was it discoverable that the subject's parents had been insune.

In the next place we observe that other neuroses, netably epilepsy, are absent in the autocodent history. Chores, hysteria, epilepsy, hemiplegic sciences are peters to occur in the ancestry of a certain class of the insune, as was seen to be the case in the insunity of female adelescents, where 20 per cent. revealed this predisposition; but such a neurotic history is attached to only 4-4 per cent. of the recurrent forms of alienation.

Again, parental intemperance-a potent source of all forms of convulsive neuroses-is revealed in 11-1 per cent. (males 8-9, and females 12%), or over son-thirds the proportion of cases shown by adolescent forms of insenity; and in 80 per cent, of such instances of parental intemperance, the father was at fault. This fact is a suggestive one, and the question naturally arises-why one form of insanity should appear, as the result of an insane inheritance, and another as the heritage from epileptic parents or grandparents, or as the outcome of parental drink! If we accept, as we have reason for so doing, the dictum that the hereditariness of insunity, like the heredity of other pathological tendencies, is restricted by sex and are, it may reasonably be assumed that the nearness of early lifecherea, hysteria, epilepsy-will be especially prous to re-assert themselves also at a similar speek in the life of the offspring; and that, therefore, an epileptic father or grandfather who become epileptic at pulsery will be liable to transmit to his sons a meebid tendency which appears as epilepay or the like at the adolescent period. Insanity, on the other hand, is not a disease of early years, and, as we have seen, is far more frequent towards the middle period of life; hence we might expect its appearances as an inherited affection to be regulated by the same laws. This is seen to be the case with the recurrent form, which is strongly inherited, and which conforms to the law of insanity in general, in being most prevalent at the middle epoch of life. Adelescent forms, however, must be differently accounted for, and may indeed with justice be conceived of as the morbid expression of an inherited neurosis of the epiloptic type-epilopsy in the collateral

or direct line tending to issue in insanity; often even by stavic descent. It is generally conceded that alcoholic craving is often an inherited condition, as in the form of "dipsomania;" and that parental intemperance frequently results in the imberility, idiocy, epilepsy, or deaf matiess of the offspring—all, we observe, indications of arrested development or disease in asrly life. To this category we may add adolescent insanity, which is especially apt to be exgendered in the offspring of those addicted to heavy similing, under certain physic logical conditions and the operation of other excitants.

To revert, however, to the recurrent form-the heredite observed in such subjects is more often ntayle than sirect-its frequent appearance in the collateral line of unites and aunts, being strong presumptive evidence in favour of an atavism even when no other record exists. Its comparatively later development than the adulescent form appears to be governed by the law of limitation by sgc, which is enforced in most beresitary affections; the ancestral affection abesirring in adult life tends to reproduce itself at the same speck. Parental intemperance declares itself almost exclusively on the father's side, but in he no means a prominent predisposing element. neurolic temperament of these intjects is revealed in an undue excitability, and a defective moral control, exhibited often in ungoverned passion, and generally mobile emotional states; occasionally, such lack of control amounts to mild forms of inhecility of the miral typecongenital defects cornering in some 12 per cent, of such cases. For the first start in life, such organizations may realify adapt themselves, and the period of puberty and adolescence passes by without serious risk; but, as the complexity of life increases in the ever more complex environment, corresponding developments do not occur, and adaptation is at heilt. The organism but awaits some exciting cause which, as with a fulninate, determines the attack of insasity. If a female, the period of gestation or parturition may so act, or, still more forcibly, the speck of the usuopame; if a male, sleokolic infulgence is a most potent agency in musing the further reduction which issues in acute innanity.

The elimanteric, as we have already stated, is a period prone to induce and feater a craving for stimulants; and hence, we find that 15-7 per cent. of female recurrents were addicted to intemperate tabits, whilst 30 per cent. of the male recurrents had ancomised to this vice. In abort, the subjects prone to recurrent instally are, in general, congenitally predisposed by defective mental organization, and inherit a strong parental or stavio tendency to instality, which assally appears upon the indulgence in alcoholic stimulants, or at the later critical epochs of life—notably the climateric and senile decrepitude.

Dr. Sankey, on the other hand, regards the periodicity of recurrent insunity as bringing this disease into close alliance with epilepsy; his statement is to this effect ... By the very character of periodicity (a character of the utmost importance in their pathology), they are allied to epilepsy, and in certain cases actually terminate in wellmarked symptoms of that disease; especially when our views of epilepsy include all the phenomena and variation of the jetic stat; now generally classed with true epilepsy."*

Nature of the Attack. The secure varies as to its symptoms and course with the exciting mane at work, and the period of life when it occurs. There may be mild manianal excitement, without obvious definitional pervention; or the attack may be characterised by delimines of anaporite and persecution; or by an ordinary hypersensio, with definitions of a depressant nature. Manianal conditions certainly provaid in the caclier and later periods of life—in addendence and in sensitity; whilst the climacteric cycle usually calls forth emotional depression and anianchous deliminate. Of unbjects prove to reservent arizones of mania or melancholia, the more important are cases of

Congressal mental defect. Results with monetrial desargement.

Adolescent insunity. Prorperal insunity.

About the insunity (acute). Climateric insunity.

Transmitten (created injury). Secile reservey.

Epileptic subjects, in whom recurrent evirones are frequent, are necessarily excluded here by their intrinsic importance, and will be considered apart.

Recurrence in Congenitally Defective States.—Those whose mental organizations are congenitally defective in both sexes are proverbially subject to passionate explosiveness, to rapid alternations of mood, and to other indications of gross instability. Such cases are often majudged, the normal undisturbed state being one of striking placidity and great anisability, which seems to render it highly improbable that the passions will so readily assume the opposite extreme; but, so it is, that such extremely anishle natures will pass, upon the most trivial disturbance, to a hitterness and a passionate demonstrativeness often exhibiting an inherent cruelty and viciousness.

With lack of inhibitory "staying" power, such individuals, as before statest, meet a severe trial during the abolescent period of life; but, if they do not successib to insurity at this epoch, they are still subject, upon the occurrence of trivial agencies, to an attack of insurity at any subsequent period of life.

The agencies which are thus potent towards such an issue are alsohelic and sexual excess, masturbation, and indulgence in sacrbid excitement of any class. Masturbation, especially, lays the groundwork for an attack of insanity by the entritive changes induced in the nervous centres—their exhaustion and the ultimate impoverishment of blood. If this vice be associated with alcebotic indulgence, the effect is vastly augmented, and the worst forms of recurrent insanity occur. Another frequent source of the attack is the powerful influence of morbid exolition—semational plays, sensational literature, "revival" services, "substitution—semational plays, sensational literature, "revival" services, "substitution of crossides; all have much to answer for in their effect upon the moral imbecile, and those lacking in moral control. Menstrual decangements, again, foster in the congenitally defective an explosiveness which may bene in an attack of insanity. In all these cases the agency, whether it be meastrual irregularity, masterbation, sexual excess, alcebolic intoxication, or undue nervous excitement from moral causes, acts by sometiming a maltestration of the central nervous system, already predisposed to insanity through a neurotic inheritance, expressed in a defective mental organisation.

In the male subject, so constituted, the attack of immity is almost invariably one of excitement, characterised by noisy, boisterous humour, mischievous conduct, destructiveness, viciousness, and outbursts of violence. Diurnal quiet often alternates with nocturnal excitement—the nights, in such cases, being spent in noisy, incoherent rambling, and often prolonged insomnia. Proquent relapses of excitement are prone to occur before convalencence is more permanently established. Should maximisation complicate the case, the subject becomes a prey to delusions of suspicion, and alternations of excitement and stupor will often take place.

In the female subject, the attack of instality occurring is also one of acute excitement, where mild forms of overall imbedity or naturally defective inhibition are maintained. The type is usually that of avealled hysterical insanity, reproducing, as it does, many prominent hysteric symptoms.

The typically hysteric subject is generally the subject of menstrual irregularities, as in the following case:

A. S., agod twenty years, mill famil, admitted May, 1879. A comin was insuraaril epileptic. This putient was, in 1808, placed in Morningade Asylum, and
remained there five months, being discharged at the respect of her french,
although probably not recovered. Her second attack, for which she was treated
here, was characterised by visited evolution; she constrained measurily or
marriage, Ar. Bis duration was short, but she was not considered sufficiently
stable to be discharged scales nion months. The menorial Suction had been
togologic source often there was amount from a mount eventals, occasionally rather
probase, more often there was amountploca. In her than two years she again
required restraint; the catameria having count, she about a month afterwards,
because restline, discipline, and cantable, point to destructiveness, and very
taskessat both in speech and demonstrate. When admitted, she was recovering
manuscul, but intensely epotic—becausing much perverted sexuality. She and
aridence of the existence of small hallocatations. She improved, and who dis-

16

charged under a twelvements. A fourth occurrence of imaging took place twenty emerica later, the extansions being on this account regular. Only alightprementation was given, and the patient became subdeply switted, violent, incoharcer, with much religious matter mixed up in for movings; but the sexual feeling only displayed stack once in three works, during which time the matter substact. Restriction was above estedfeeted in connection with irregularity of measured function, which connected later; it did not mass until the naturesia had recomed their normal characters. Discharged in thereon mustbe.

Another reliepes, eight months subsequently, was purely maniacal in kind; there was ranching at first open religious topics, slight or as evidence of croticism, and my arbied irregularity of menetrual perference—which, it was stated, proceally erord on the side of insufficiency. Seven months accomplished a current sixth and last admission occupred eight months later; menatrual derangement had again proceded. The condition was one of simple mania, with great seligiosity, but without sexual characters, predominating. Correlescome occupred immediately the catamerical irregularity was rescaled. Sent cut in irrest mention

Recurrence in Adolescent Cases.—Adolescence occasionally ushers in recurrent attacks of mania—three or four such seitures, between the ages of accenteen and twenty-five years, being sometimes witnessed. In all such instances, the symptoms reproduce over and over again the features (already delineated) of intantity occurring at this epoch. Recurrent mania originating slaving adolescence is of very aminute portent; the prognosis is exceptionally unfavourable, in so far that it indicates, for a large proportion of cases, a congenitally defective mental organisation; that many others are discussed to successive attacks beyond this period of life; and that the cent remain chronic residents of our asyluma, or are discharged as partial "recoveries" only—or their recovery, if at all complete, takes place after a protracted illness, often embracing successive relapses.

M. C. W., agod eightem, single; a tall, well-proportioned girl, of amicwhat delicate aspect, feeble remember development, dark brown hair, light blue sysu, complexion fair, expression bright, minuted, and intelligent. For some time part she has been in delicate health, and it distinctly assessio. She brings with her a strong negrotic beritage; her maternal grandmother was twice under treatment at an asylant, her amutal balance overthrown each time by "some loty affair;" her own mother is highly econorie; and she beneff has been regarded as vary anerable, flighty, and coratio. The summents have been experience of late, and of fortnightly occurrence. For a mouth prior to her attack, the patient had been attending entiting religious services, "revival meetings," and had been entitled over these subjects, talking tench in a religious strain. The attack occurred a few days before adminion; she became acately estriated, gerralous, and incoherent. On removal to the workhouse infirmary, the tore-down the pade of the padded room, was extremely violent, and her conduct most natrageous. When brought to the asylom, the married condition was will acute; she was good compared, joyed, mischievan, talked incompily, and partialled from subject to subject, but rould carry on a connected discourse on shootly questioning for, and insisting upon a reply. She had a dippost air, was port in her remarks, and skewed. Appeared quite answare of the nature of her earroundings. Left to nevedl, she talked incoherently, interspensing for remarks with frequent allestion to " angels, held,

and davile," saying that she hourd "traure whatfling telegrams to heaven, when at the workhouse."

Half an owner of the success coult was ordered twee duity, and shieral was given occasionally at right to secure sleep. In four days it is enterly "Mach note compared and rational; sheps well, and is trying to employ broad unfully; has not yet lost the flightness of behaviour and demonstrar; appetite good." In a formight she was in the "somewhencest" word. A month subsequent to her adminion a complete retigue occarved, characterised as below by noisy, houserons behaviour, great infarity, pertures, and occasional institutes; her nights were not disturbed by uncitement. Commo (success conit) was given in one came dose twee slaity, and towards the middle of the worth the excitement whited, and the hermon sufficiently staid to amount the workly disco. Enough a month ofter the first relayer, a second occars, in which she again proves holsterium, violent, and destructive; her holdly health, however, has been progressively improving enco her adminion. It was clearly seen that her relayers were coloridar and the sensitival persons, that the occurrence of the next person was passed without any meaning disturbance, and she was discharged, recovered, a few weeks unbequeatly.

Six years later, that is, when twenty-four years of age, this patient again because an innate of our words. She had kept well, and regularly supplyed as a dyer foring the inverval, when, agen the recurrence of a pecuniary less by her mother, the diagotter again successful to her inherited weakness. She was entainedly excited, though not in an extreme degree. There was marked elevation of spirits able was well-satisfied, gay, flippart, and mucy. She talked loguanously, very trationally, and incoherently. Her tore is careless, almost abundanced. She mater.—I am Adam's first sharghter, and came here in the year 1; came here because my mother mans first: I think I couldn't give you now straightforward answers, could I?" then larghs and becomes obscure and repulsive.

As on the former occasion, the environment completely absted in a formight's time from adminion; but only to enture again to a violent form, marked by all the features above depicted, and extending over a period of about two encerts, when a gradual improvement recorded, until complete convulences was ensured.

Recurrence at the Climacteric, —Here, again, we recognise the form of inantity which is regarded as more or less characteristic at this period of life; it signifies little when the recurrent seizures originated, whether during adolescence, later adult life, or at the menopouse, the symptoms of the attack existing at this latter period conform to those with which we are familiar at this revolutionary epoch. Former attacks may have been characterised by manifest excitement—the attack at the chimacteric is almost certainly one of depression, mental ancest and gloom, and of defusional perventions of the metancholic stamp. Take for instance, as illustrative of this statement, the following case in which climacteric intanity eventually toped in smile insanity:—

H. O., agod forcy eight, married. Mintery of paternal intersperance—an anaplaring terrell—an track died in a leastle asylone. H. O. had been intersperate, but had support good health. Of three children torne by her, our died of ourvaluous. The alleged course of her present attack was domestic as nicty, embracing supposed arbitrary in the part of his hashand, and comming at the period of the chimacteric. Depression of mind, lasting some six member, sufficiently in attack of metacolotto, with marked delinious of suspicion, from which size recovered after a residence of ten weeks.

Was as almitted after the lapse of thertom years. Part of this interval had been spent in Washing Asylans, and she had been discharged but one week when deposition of approximately approximate bean heart her, and she developed the delenium that observance was secretly affinished to her. She admitted having home addition for years to alcohol in excess; showed great defect of memory, with much blusting of intellect and emotions. Was industries in habits, but heavy and alongsth in manner, and of waterl expression. Recovered four months after admittance.

Remaining at home for hinsteen mouths, she managed to perform her homehold dation fairly, and though never quite well, was orderly and manageable. Gradually, the developed defenses of the feeter type-suggests of intended have and aftempts to effort from her, bising these or terroribus conditions of her little, and apparently also no servain anomalous subjection sensitions, perhaps hallocinatory. There was some progressive demontia and slaggishness of intellectual operations, with emotional dubous and, repectally, defect of memory. Novertheless, in two months' time she supressed sufficiently to justify her discharge. Her receivery only lasted a couple of mortle, though she abstained from abuled a the developed restlement, incomin, reducted tears, and delutions. When re-admitted for the fourth time, she was anxious and apprehensive, but not hundred with suspictors to the same extent or before; complained of confused beding in her book, was inappreciative and highly forgetful. From that time forth she was often cestion and uncettied, fancying that her relations were about the hullding, experiencing both axral hallocinations and visual illusions, and showing much mental endocoloment and ever-increasing father of memory. There was much pallor of the face, the skin assessed a purchased like aspect, and the larger resuch began to evidence atheromaticae thange. In this state she still remains an intuite of the agricus.

The instances of recurrent insanity, recorded in eighty women, took their origin at the following respective ages:-

Value Dyna - Olyna - O

From this table we glean the fact that although the largest proportion of cases of recurrent insanity admitted are from forty to mixty years of age, yet the greater number of recurrents date their first attack from twenty to thirty years of age; and that nearly the same proportion of first attacks occur from thirty to fifty years, as for all periods below thirty. The large accumulation of cases, therefore, which appears from forty to sixty years of age, is due not to the greater tendency to the origination of this form of insanity at this epoch of life—in fact, we see the tendency decline towards fifty—but to the addition of patients who have already had attacks in earlier life. Hence, we must conclude that this epoch of life has no appecial inflaence in originaring this form of imanity; but that it is especially prose to excite its recurrence in those who have already suffered therefore.

Recurrence at the Senile Epoch.—The same reasoning applies to the later spech of senility. Reverting to the same table, it is evident that although as many as twenty-four mass of recurrent instally were admitted between the ages of fifty and sixty years, the great bulk were but relice of former storms, since three out of the number only appear to have had their first attack of instally in this, the sixth decade of life.

J. S., aged sixty, married. Patient belonged to a highly nearestic stock. Her mother and sister were both insune ; are brother out his throat ; and, at a subsequest period, her sister's not, becoming the orbject of impulsive insinity, worstered his mather in the most leveral manner, kirking her to death, and causing the most terrible mutilities of her head and hody. Her symptom had shown a long promonitory stage; but door mouths prior to admission, she was restless, garralous, betraped alternations of despondency and excitability, with suspicious tendencies. When she came under observation, she was low spirited, possessed of illufritual apprehension of exil, and between painful emition over trivialities, totally, inalogains to provoke each distress in a normal state. She had a sharp, weasoned sepect, with dark piercing eyes; was emanated and shrunken. A decided hypochontrianal element was indicated by the prominence assigned to imaginary attentia sed a curving for sympathy. She would talk for losers about her allments, and was most importunate open such subjects at all times. Incommity, restless, also, at times, proved most impulsive; her uncontrollable feelings being embodied by her in an imaginary affinent, "tich in the blood," to which she declared she was subject. At her worst memeric, the world its passionately at offer palients without any provocation, enforcement to infact injury upon them, arel subsequently, exists a hypometrical pentience, and quentionly dwell upon lesallocate ; at other times, her impulsiveness tended to enterful acts. Being disclarged, "relaced," to her budged's care, she subsequently relepsed, and then attempted languag herself in a wardrobe; but, being detected, rathed to the sendor with intest to leap from it. She was re-almitted, and removed at the asylars fietful, self-engrossel, importants, and impolitive in conduct to her death at the age of severny-two.

All our evidence, therefore, points to the late adolescent and early adult life as the period peculiarly prope to this form of nervices disease; nor need we be surprised at the fact, for at this period we need with important revolutionary changes in the economy, the tendency to the fostering of morbid excitement, and alcoholic indulgence; at a period when in the struggle for existence the demands for a more refined, delicate, and complex adaptation are importatively made upon the organism, and tell with especial effect, therefore, on the central co-cedinating necessary system. Given these as the influences operating in the development of the parental form, the law of "limitation by age" will apply as explanatory of its re-appearance at the same period in the offspring.

Recurrence in Puerperal Cases.—A certain properties of women betray a tendency to manifecal perversions upon the accomplishment of each particition, or during the early days of each puerperam. These are subjects whose heritage is probably identical with those already considered. In no particular does the seizure differ from what we know of ordinary puerperal mania, other than in this simple tendency to recur.

M. B., aged tweetveight, named. History of paternal intersperance a tittle melascholie, but slid not require asylam treatment. The partient, after her fourth confinences, a severe one, developed symptotes of ineasity, and one removed to Waddley, where she was retained about two months. Four months prior to her adramion at Walerfield, for fifth confinement occurred, after which the became depressed, distrustful of her landmed, and munifolded distants towards has industfinally, threatened to commut entode and cut the throats of her trushend and family. When received into the arriver, she was execultaring from manis and rapidly became quiet, trabuttions, and fairly thereful. There was neither contransported, nor peturn to, the luminodal tendency ; she was sent out recovered in less than two murths. The interval between the preceding and the following attack was flyo years, during which time potient had two sloldren; the last labour being followed by post-pursua formershape and, more remotely, by produce menstruction. It appeared that she near showed mostal aborration after her discharge, devokping empirious since about her neighbours, and famying that they juved at her and called her comes, and it was stated that also attempted to put her child's throst. On re-elements, there was much intellectual and smotional torpor, gloon and apprehentiseness of evil, and for some time much quention and fortid behaviour, arristy, and hypothendrical faccies, which, at times, were enaggerated into actual deletions of ampieton; after a period of four position the gradually became more cheerful and composed, and one mouth later was fitted for thickneys,

Recurrence in Traumatic Cases.—It is a fact of no small import, that 20 per cent, of the male recurrents had undered from cranial injury, usually due to falls from a height upon the head, or to a violent blow causing temporary unconsciousness. The injury in no case amounted to fracture, or depression of bone, but was probably confined to nolecular disturbance and nutritive anomalies thereby established. The following case is an instance of inounity engendered in an individual of the criminal type, wherein cranial injury and alcohol were important factors in the causation:—

B. L., aged threaty server, married, hawker; transferred from good. The only information as to the family history of this potient was obtainable from the latter larger, who stated that her father had been an excessive drinker, and her sister as insuce of the W. R. Asylum.

She was committed to twelve mouths' hard labour for mostlying and symming a woman whom she believed to enhant with her backend. This belief, as well as the alleged creatly remarks her of the latter, appeared to be actual here, which, added to long and exceeding initially not in alcoholo stimulants, had produced her present mouthf describe. Her backend was doubly sourced, as the analy of manner received by a full upon the total some manner previously.

Whilst in pence, the patient behaved with great enderse to her followprimiers and the warders, and, on one occasion, made a desperite attempt at mirror, being discovered in her cell, blank in the face from strangulation, effected by a piece of cord the wardet he rock. During this time, also, she maintained an abstracte idence. She spoke on removal to the argiem, explaining that God had explained her to be done while she was in hell—i.e., priors. At first abstracted and ampissons, exhibiting many purposeless thinks of genture and constraines, the quickly because an active and inflantations instate, showing, however, some irrationality, together with considerable want of control. Although no delucions of suspicion reporting these surrounding her were manifest, yet the low type of her appearance received conferentian in occasional centerate of violence, without also pate cause, and at all times characterised by the atmost heritality. Her behaviour, because, not describe of the license of insurity, she was, after a residence of three months, sent back to gook

In less than two months she had mother outbreak, and became most violent, alsower, and bud moutbed; precuring a medicine buttle belonging to another princer she, with the intention of minish, shows half its contents below she could be prevented. She was, on her return to the asylms, most manual, aggressive, obscesse, and apparently the subject of halfocasations. In this state she remained by marriy a week, when she commerced gradually to improve, and altimately settled down into a quite affable patient of industrians habits, whis the exception of two or three passecuate catherets of short duration. Apart from around manuity, nevertheless, she could only be regarded as of low and degraded tatters. Ducharged within a month of the expiration of her sentence. "splicyod." Since her discharge she has frequently figured in the police courts; has been several times in prism, and, during her improcument, her conduct has been characterised by the atmost brutality, forccious violence, and sindustrieness.

Frequency of Morbid Impulse, Some 51 per cent of the 136 instances of recurrent immitty manifested suicidal tendencies, both sexes being about equally subject to such promptings. The undencholic forms, and the maniscal outbursts associated with depressing delances, were especially grans to such impulses; thus, six cases alone show this tendency in women below the age of forty years, all the remaining suicidal cases being at the climacteric period.

In the male, on the other hand, this morbid tendency comes out strongly in the yeasyer members; but in all these instances the form of invanity was that characteristic of alcoholic and massurfastic excesses, and delusions of persecution prevailed in each. Even in the few cases occurring below forty years of age in the female, the selfdestructive impulse appeared based upon congenital instability or alcoholic indulgence.

Dangerous aggressive conduct prevailed in over 52 per cent. of female resurrents, and in 64 per cent. of the moles, or an average for both sexes of 58 per cent.

Hence, recurrent insumity ambraces a very high proportion of individuals dangerous to others—a fact explained, in like manner, by the large number addicted to virian habits of life, and especially alcoholic excess. With respect to this morbid impulsiveness, Dr. Sankey, reafferning with M. Merel its resemblance to spilepsy. writes -"There is the same periodicity in the cases, the same impulsiseness, and the same ignorance or blindness of their own position; and though the acts of violence are not attended with any enconsciousness, yet they seem scarcely voluntary." a Amongst this class are comprised many of the criminal community of low mental type, often associated with a degraded physical conformation. These patients are almost all confermed drunkseds; spend the greater part of their life between the prison and the stylem; and, in the former, often sham insunity with the object of attaining their removal to an avrium. Here, if not repressed, they would become the tyranta of the community amongst whom they live; and, in their maniscal attacks, are most daugerously impulsive, reckless of life ar limb; their conjuct often prompted by the atmost bratality and the most visious instincts. Beyond the trouble given by the criminal class in an institution where severe repressive measures are to be discouraged, they form a scourge to the younger and more respectable class of patients whose maledy is their misfortane, and whose former associations were for different. This social will is a hist upon our legislature. that loadly calls for redress.

Hallprinations and Delusions, - Hallprinations prevailed in 22.7 per cent of the recurrent cases—the visual and aired in about the same properties, and both associated in a few cases; offictory Inflacinations or illusions were seldom noted, and pustatory were notably absent. Definions occur in at least half the cases (51 per cent.). Both hallocinatory and delusional states vary with the proximate cause of the outbreak; if alcoholic excess enters largely into the causation, we may anticipate associated ideas of self-importance, rank, power, wenth, and suspicion of periody upon the part of those around him. One putient receives a nightly visit from his estanic majority; another sees imps around him, hears voices beneath the Boor-the neise and rumble of machinery, which his morbid imagination frames into some lifes of coming fecture. Another patient, twenty-right years of age, addicted to intemperance in drink, and the subject of a serious cramial injury in youth, calls himself Sir-Roger Tichhorne, and accesse his relatives of filling his bedroom with the supour of chloroform. Another young alcoholic subject owns property "to the value of thorsands a year"-has extraordinary mineralar power, and can "walk eighty miles a day continuously," Deluctous of poisoning are frequent in these alcoholic cases, as are also actions of being deprived of property and rights, or being pursued by the messengers of the law. One typical case, aged thirty-eight years, with a homory of paternal intemperance and strong collateral

insanity (two sisters being insane), himself for years a heavy drinker, developed, upon his third outbreak of insanity, the notion (from certain subjective feelings referred to the chest) that some saysterious clockwork was concealed there, which caused him much agony and derauged his mind. He could scarcely be restrained from injuring himself, and often begged to be operated upon with a view to its removal. He frequently braised himself seriously over the front of the chest by violent blows of the closed fast.

J.fi., aged thirty on sampled, a felt-hawker. Has had no previous ottack of instally. Eight days previously he because maniacal and dangerously aggressive; was under the constant charge of two men at the workboose, whitler he had been taken. There he attempted to loap from a window, and struck his forehow! with a soft water builds, inflicting a power gask, with saterdal talent. Upon admission he was depressed, heavy, and slaggeds, yet sufficiently value to give a clear account of himself. He was ill neurished, with flatby muscles; complexion inflow and dirity; several deeply-incised wounds recently inflicted were observed on forehead; expression depressed and torque. Patient gave a lintury of accentre drinking for some years part, as also of an attack of deliceum feronse; had been drinking. quite recently, and "east all note of things about him." Two sistem ware insure, but all other autsordents free from neuross; his father was a heavy drinker. He admitted being jealous of his wife, whose fidelity he questioned, and he had therefore descriped for and his children. During the first week he remained merially depresed, persive, self-absorbed, and feactive; rainly spake, but said he was quite "beakle himself" when he cut his forehead; appettic good; "marty fool objects" surround him; was gleomy. A week later so further illusory or hallscratery state prevailed; appeared of normal constituences, and was shortly afterwards employed for a time at work, and discharged.

The rest consists upon which we have of him was two pears following his decharge. During the interval he had gone to America, counsed his drawing, liabile, and was soon as immage of the Trenton Anylom. When pe admitted here, he had developed typical defendes; declared that some clock-work was written his cheef—the increments were increased, caused him great sufficient, and allowed him no cost; bilt impelled to resonait misside. The case of a man also was leveral speaking to him from within his body. He was invitable, recleat, dangerously saircial, and his language abstrice and binsphresson. He describes the "slock" as his about as usualing scenations like "a stopping machine; "it does not it would "rive his heart cost;" bugs to have a suggical operation preferred upon his cheet, that "the machinery may be not out;" and he points to several recent braises over the macalizina inflated by his elemented first to relieve the angulah he forly. Believes certain men have placed the "-dockwork" there to make him jump and dance about whenever they choose. He become much agitated and cented during this parration; talked insertedly and introducedly.

For you must be continued to exhibit the symptoms above described, was always equitable, spoke in a horized flow of words, but was unknown; ; be proved through in his disposition to those around form, took much interest in his disposition engineering, and was fairly cheering.

A relapse occurred two mostles later; the deliment became again more prerament, and he expectedly throusened to cell bit throat. For the subjective anomalies became were applied to the numbers on, but without cought. Broads and chical was then given with very considerable benefit; the pain gradually subshiel; his sloop was examined at night; and in my weeks' time for declared framed from true may meeted separations, had feet his deliminal sections; was quite extremal in recoverse, and left the argum.

In me needle later he again became an immate, suffering from his fourth attack of marrie-4 point. The "clockwork" still droves him fraction for mant cut upon his con short and remove it, to will " split open the short of some one cles ;" he will " murder those who persecute him." Says he went home, worked steadily, and remained quite well, abstaining from drink for two weeks, and then the pertible feelings in his chest began again, causing sharp lanciasting pains, which had "the power of arresting his breathing, and raised agony even to his finger-tips." He strikes latered sicketally upon the short in short despuir, and is much tenied toothe sterners. Threatens to take his own life unless relieved by some operation ; is very excitable, garralous, circumfacutory, irats. He took liquor spir with spiritte atheris salph, (15 mins, xv.) twice daily. During the first fortnight he derived relief from the optate, but continued to exhibit mild estrical excitement. He remained very deleteled, and about this time, having secured a knile to retired to a closet, and inflicted a deep incised would down the front of the plant over the sterrum ere he was detected. Chloral and branids (12 grs. xxx.) were substituted for the opinin twice duly; steady improvement took place—he lost his paintal sensations, but upon retrospect he still affirmed the reality of the diabolical eaching which had been introduced into be client. A few weeks later he was finally discharged as reconsest.

Prognosis. —A large proportion of the recurrent insane who enter our asylutes after successive attacks of insanity become chronic instates, or are discharged as partial curve only, or the disease proves fatal. Considerable disparity, however, appears to be maintained between the rate of recovery amongst the male and the female residents; the fermer range as high as 71-4 per cent. of the total number, the latter 57-5 per cent. If we group together as "unfavourable cases" all partial recoveries, deaths, and chronic remnants of the recurrent female class, we find these amount to 40 out of a total of 100 cases.

We find that of the "relieved," the deaths, and the "remaining," only 10 cases of the 40 were under Sorty years of age, the melanchillo form which prevails beyond this age being a far less recoverable form of insanity than the acute excitement of earlier life. One most unfavourable aspect of recurrent imanity, therefore, is that of a recurrence at the period of forty and upwards; in fact, if we fall to break through the periodicity established in our patients' morbid tendencior, before this age, the outlook is very ominant—the lucid intervals between their attacks become of shorter sizeation, and the mental stability at their best moments so inscours, that in impulsive forms it becomes imperative to beep them under continuous supervision. The period of colin between the attacks is not only more uncertain in its duration, but there is now betrayed a stendily advancing mental enfectionment; and, as dementia decigna, so do the attacks of excitement or depression become more frequent and more prolonged; yet, even in these advanced cases, the periodicity of the

disease is maintained. Dr. Blandford eites the case of a man of more than eighty years of age, who came under his observation, whose first attack happened when he was seventeen, and who had been placed under supervision for recurrent attacks three-and-thirty times." A patient at the West Riding Asylum between the age of thirty-two and forty-two had an attack almost every year, nine in fact; between each of which she was discharged, and resumed her household divises with energy and ability, manifesting no intellectual impairment or emotional instability.

In another case—a married woman, addicted to heavy drinking, had her frut attack at the age of thirty-five, and from this period through the whole of the climacteric, was subject to repeated attacks of maniaral excitement of a wild, boisterous, and dangerous nature, with obscene and most objectionable behaviour. In her case, asylum supervision was required on ten occasions up to the age of sixty years; but, for several other attacks of excitement, she was treated at home and recovered.

In yet another instance, a young girl of congenitally weak moral control suffered from three successive attacks, with complete lucid intervals, between the ages of seventeen and nineteen; she returned home and resumed her duties in the intervals of her attacks. Three further attacks occurred up to the age of twenty-four years, when her mental equilibrium was so far unsteaded that she continues, up to the present time (a period of ten years), an inmate of our wards. During this latter resistence she has had repeated attacks of excitement, and her periods of calm are now greatly broken by hysteric symptoms, in which erotic manifestations are prominent. In her case, also, diurnal calm often alternates with noctarnal restlessness, gentle excitement, and garrulity.

"The disorder, once set up in the individual's conditioning, is posse to mean, and we must exacting the whole question of the periodicity of disease, as well as the conditions of the first attack, before we can hope to throw any light upon the subject. This small we may conclude, that the conditions which procede the first are not revenuely to subsequent attacks; that as epileptic sciences may continue after the octoorbile cause of the first its in removed—e.g., worms—so the disorder care recurring may repeat strell, personnelly reastining as a vice of the constitution of the individual; of which it new forms a portion? (Blandford) t.

With this statement of Dr. Blandford we fully agree, so long as at is understood that the conditions of the first attack, to which he allades, are environing, and not organized, conditions; for it is allimportant to bear in mind that a very large proportion of the cases exhibit a powerful hereditary predisposition to insunity, and that we always fail to elicit to the full extent from the most exceful enquiries the magnitude and importance of inherited neurotic conditions. Yet

^{*} Jasouity and its Treatmost, p. 71. † Op. cit., p. 72.

out of the 120 persons who were subject to recurrent sciences, permitting them to return to their homes in the intervals of their attacks, we found very definite and undoubted evidence of inherited insanity, of other neuroses, or a history of parental intemperance, or of severe crantal injury in seventy individuals (51.4 per cent.). If, therefore, in such all the cases such powerful pestisposing factors to found, any one familiar with statistical research in this direction will add a wide saught for similar agencies in other cases not divulged, too remote for detection, or in patients whose untecedents are utterly unknown, as so often occurs in the class with which we deal at large purper institutions. If we now group together promisensusty all the recurrent individuals of our past ten years' experience at the West Riving Asylam, we may construct from their histories a chart of recoveries, such as is given on Chart A.

A steady increase occurs in the number of recoveries up to the sixth month, when a climax is reached—difty-four of the usual 100 cases of recovery (or 167 total cases under treatment) buring been discharged. One half the recoverable cases, therefore, are well by the sixth month; a notable fall occurs between the seventh and eighth months, with a slight rise of seven cases at the ninth month, again to decline to the level of one or two cases monthly until the thirteenth month, after which the recoveries are few and distant—e.g., one at twenty months, one at two years, and one at six years.

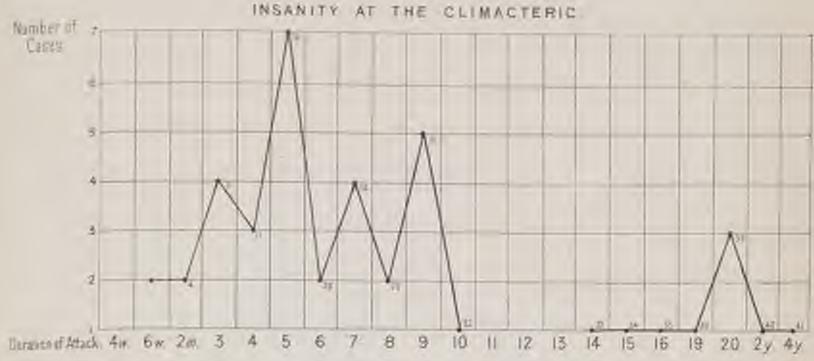
The recovery line for the men differs from that of the wanter is attaining the climax two months later; the largest proportion of cures for female recurrents (accentees) taking place during the fourth manch of their attack, and steadily declining to the screnth; whilst the manimum of male recoveries (twenty-six) occurs at the sixth month, dropping anddenly to one case for the seventh and eighth months. Of the females, whose recovery was protracted beyond the minth month, all without exception were above forty years of age, had suffered from several previous attacks, or were subjects of conjected mental digital.

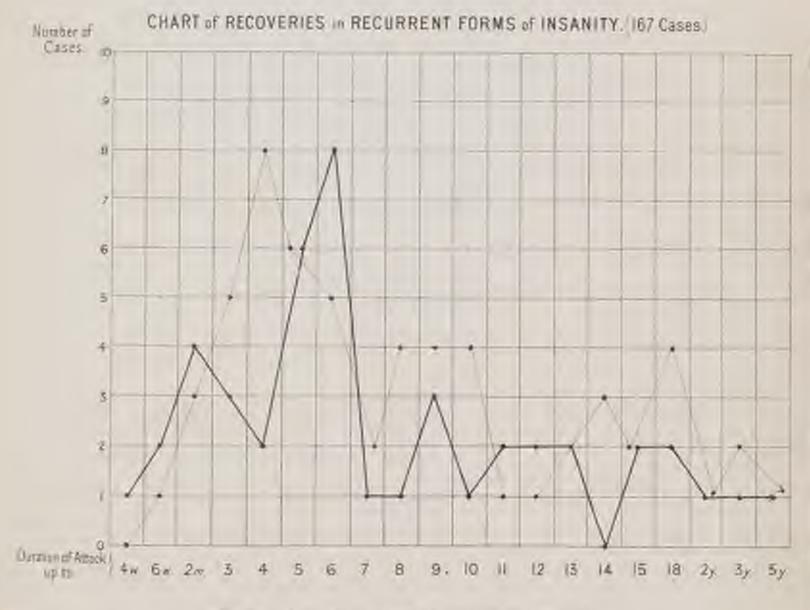
Circular Insanity (Folie Circulaire, Folie a Double Forme).— This is a condition where melancholis and mania, or the reverse, follow each other is invariable requence, with or without a shorter or longer interval of lucidity. Between the attacks of melanchelia and mania there may exist a period when the subject can be regarded as in neither phase, but calm, lucid, and apparently stable; as that there may be some danger of mistaking the locid interval as our of actual recovery, rather than the transition period from one to the other mental phase.

Or again, there may be no such intermintion, but the depression may gradually districted, pushing insensibly into excitement.

In like manner, the successive sycles of excitement and deposition

CHART of RECOVERIES





NOTE - Black Line MALE Recurrents 07 Choca Bolled Line FEMALE - 100

ANALYSIS OF RESULTS

Re	covered	Relieved	Bied	Chronic
Male	46	14:	3	4
Esmale	5.9	16:	0.	18



may be separated by so short an interval of lucidity that the attacks themselves appear continuous—no intermission whatever occurring. We therefore recognise in the history of such cases the stage of

- (a) Maniacal reductions:
- (a) Melancholic reductions;

(b) Transition :

(d) Interparacysmal lucidity.

In many cases the stages à and of may be entirely about.

Should there be no interpressymmal period the attacks of irelansholin and mania alternate constantly, establishing thus a continued imanity of alternating mental phases—the true Folic Circulaire of many nathors; whilst, if the interpressymmal stage be well marked, we have the intermittent form of circular imanity.

The stage of depression may reproduce any of the unual forms of melauchalia, stupor, or melauchalis stupor; in no respect is the form of reduction peculiar to this disease, in like manner, the manisms reductions may extend to any depth, issuing in the gentlest or the must scate degree of excitement. In the nature of the depression or excitement there is no feature which specially stumps this affection beyond the alternating character of the reductions.

Although in individual cases each stack is almost an exact counterpart of that which has preceded it—and this as regards intensity and univers of symptoms, daration of each stage and of the complete cycle—yet, in different subjects, great diversity is shown in all these particulars. Each stage of reduction may last from a day or two to several weeks or months, and the interparcely small period is subject to the same uncertainty. The affection is notably a chronic and incorable one; and, although in certain cases a year or more may intervent between the attacks, the tendency to recur soon betrays itself, and very rare indeed are the implances of recovery.

Enology.—Although classed under the leading of recurrent forms of instality, it will be seen that the family alliance is by no means so close as this neight at drat seem to imply. The tendency to recur; the reproduction of similar mental plases; the peculiarly incurable nature of the disease; and lastly, the strong hereditary basis upon which it is engrafted, neight suggest this alliance. When, however, we more closely study the etiology of this effection we are at once struck by much dissimilarity; the following factors illustrate this

See. It prevails far more frequently in woman than in men; all writers alike assert the influence of sex in this direction.

.ige. -Puberty and the period following, up to thirty, affect by far the greater proportion of cases of Folio Circulaire.

Heredity.—Direct heredity plays an important rife in its development. A neurotic heritage, epilepsy, alcoholism, chores, bysteria, and insanity are the constant antecedents of this affection in the ancestry.

Prentaced.-When considering the etiology of recurrent forms of inunity, we emphasized the Aeroditeriness of the affection, and the unstable, defective, mental organisation of the subject. We regard the indulgency in alcabolic stimulants as having, perhaps, a more fatal effect. usen the subjects of this, than of those of any other form of insanity. Alcoholic treatment here is decidedly most persicious. In fact, all forms of the explosive memors do better without any alcohol-even when their disease does not appear to have been engendered by undue indulgence in stimulants. We often find that the subject craves for alcohol, and also for all sorts of mental excitation; but these must be withheld wherever they tend to induce the best emotional instability. Our abset-anchor in the frestment of these affections is much outdoor exercise, with active magnal employment for both sexes, long walks, cheerful acciety, and avoidance of association with the more excitable chronic lumnties. With this there should be given a literal, wholesome dietary. By some authorities it has been considered wall to limit the most-fiet, and to add largely to the farinaceous and vegetable constituents of the food-a suggestion which applies also to the spileptic and other convulsive neuroses. We do not ourselves regard the paration of the advisability of a furinaceous diet as conclusively proved in the case of the convalsive pearons; the most important attempt to practically test the question in epilepsy, was recorded by Dr. Merson, in the "West Riding Asylom Medical Reports for 1875," the result being in the main favourable to this dietary, but based upon too limited a number of instances to warrant final acceptance.

Bromide of potassium, in combination with Indian hemp (32 grains of the former to a fluid direction of the tincture), is the best remedy for the states of scute excitement. The patient's appetite is never prejudicially affected by it. In most cases of this class they take feed more readily with, then without, this treatment.

The exultation of the sexual instincts, which so often characterises these recurrent seizures, renders iron and the compound phosphates imaginisticle in many cases. In most adolescents the recurrent attacks are best met by bromides alone, careful attention to the howels, segular exercise, the spinal douche, followed by friction of the serface; and, if there be much insemnia, an occasional chloral draught.

The phosphatic preparations, with cod-liver oil, may, however, be given with benefit in the recurrent attacks of melancholis incident to the climacteric and the bromide of potassium, in combination with the perchloride of iron is often advantageously prescribed.

In the circular form of insanity the general principles which guide us in the treatment of manis and melauchelia must also here be relied upon. Attempts have been unde to cut short the periodicity of this affection by such remedies as quinino, digitalis, cumulois, morphia, and the trunides. Quinine has been administered in large doses, up to 30 grains, but with indifferent results; a better pullistive treatment is that of the tonic regimen applicable to all cases of periodical forms of insanity.

EPILEPTIC INSANITY.

Contents: Definition - Epileptic Nearons - Immediate and Bemote Results at Epileptic Dacharge - Definition-currents - National Nerve tracts - Discharge Iron Sensory Areas - The Asra in Sensory Epilepsies - Epileptic Amiserons, Hemisterptis and Hemistersthess - Charging Movements - Proparatysmal Fage - Frencestory Stage - Special Sense Arra - Vaco motor and Viscous Aura-The Epileptic Parenges-Grand and Twist Mal - Post-parenyemal Period - Dust-spileptic Automation - Case of E. C. Haten Epileptical Interparatysmal Stage - Epileptic Hypochoodmans, Automation and Impeliateness - Medico-legal Belattonskips - Impulse - Debasius - Malingering - Reg. v. Taylor Treatment of Epileptic Researchy.

By epileptic insanity we mean that form of mental derangement in the antecedent history, oncome, and further development of which we recognize an intimate connection with the culleptic neurosis. Such functional listurbances of the nervous mechanism as little in what are termed spilepsies may, or may not, have for their accompanissent serious mental derangement. Entleptic fits may continue for veies with alight, or marcely appreciable, mental disturbance. If however, the entireptic neurosis presents on the physical side a parallel disorder of mind, we speak of it as epileptic instalty. Epilepsies may developduring the course of other cerebral diseases associated with insanity as pure accidents, or as an intervarrent affection, in chronic discreasination of the besin, in softening from embolism or thrombosis, in senile atrophy and decay, during the progress of general paralysis of the insane, or in certain cases of shronic insanity, the epilepsy then being merely an accidental complication of the primary affection, and dependent, prolinbly, in part upon the direction taken by the disease. Nor can it be questioned that epilepsy may arise as an independent and intercurrent disturbance in subjects mentally afflicted, having no direct consection with the primary cerebral decongement, and it becomes therefore imporative that we learn to recognise such morbid lineaments, so to speak, in the mental affection as indicate its kinship to an epileptic neurosis.

The mental devangement of the epileptic may assume the form of maniscal excitement, of melancholic depression, of mental enfection ment or dementia, or of debusional persension or perventions of the moral being: any one or more of these states may be revealed by the patient. As in all cases of insurity alike, so epil-ptic insurity notably presents periods of heightened functional commetton, with inservals of comparative calm, periods of sudden and excessive, though transient, dissolutions, and the persistent impairment due to a constantly advancing though gradual, dissolution.

The issuediate results of an epileptic discharge are seen in the deep reductions of epileptic mania—a transfert condition only; the efficient results of expeated attacks in the gradual and persistent impairment of the mental farelties seen in epileptic descentia. Hence, in studying epileptic insanity, we have to consider the acute symptoms or immedate after effects of a fit, as well as the chronic impairment presented during the intervening periods between the attacks. It is not, is before stated, every form of epilepsy which is prone to issue in mental derangement, if by epilepsy we mean what Dr. Hughlings-Jackross means, that is—"A arabien, rapid, excessive, occasional, and local discharge of careford cortex."

It is when the functional disturbance occurs in the highest nervous arrangements of the cerebral cortex ("the substrata of conoclousness") that the mind is prone to suffer. An all-important principle which the same authority has taught us to recognize is that, in these opil optic sciences, there is a 'ensta' expenditure of force wholly out of proportion to the normal physiological outlay, and wholly inconsistent with continued healthy activity of the parts concerned. So severe is the asplaces violence, that the nervous tracts traversed by the storm are so decayed as to be rendered transferrity incapacitated for the farther conduction of the nervo current, and the centre itself is parallyzed for the time by its enormous expenditure of energy.

If we attend carefully to this fact, it will be apparent to us that the transicut paralysis of the motor centres and nerves is not the only or most important sequel of the solutre. We are aware that every vivid mental robustsal initiatory of an act (especially when the action is itself suppressed) is attended by diffusion currents, which, according to the physiological law of least resistance, affect first the smallest musculature, e.y., the evokall and facial muscles; and even when these results are not apparent, expend themselves along inter-corebral tracts, arouning sensory excitations and correlated feelings. Just us the substrata of these representative states affect cartical realms other than those in which the primary excitation arises, so likewise, during the accumplishment of every volition, the act is accompanied by as-called associated actions (e.g., the associated contraction of pupil and convergence of eyebally, and this series of associated movements is a very large one in the active manifestations of the organism. But this is not all. We know that both the initiatory energising of the cortex and its overtual actualisation are attended by numerous complex feelings, such as a memory of similar acts proviously performed, of their results, and of the notion of the utility of the act to the "individual" welfare.

[&]quot;See West Richary American Exports, vol. at ., p. 231.

All this means, of course, diffusion currents around the primary discharging centre.

If, then, all energining and ancharging of motor centres he accompanied by such effects in related centres, how much greater will be the effect when the motor areas are overflooded by the brutal explosiveress of spileptic discharges. We shall then have not only the paralysis of the conducting tracts, but also a dangerous flooding of these delicate, yet indefinitely extended, tracts of intra-certical nerve-tissue, upon which the very evolution of the nervous structure slepends. If we place any credence whatmever in the theory of nerve-genesis so elaborately worked out by Herbert Spencer, we must regard this undue forcing of nascent nerve-tracts, so yet incomplete in their formation, as a most serious matter in epilepsy.

It is important to observe that any one part of the cerebral correx may be the site of an epileptic discharge; and hence, the resultant phenomena will be co-extensive with the multiplicity of orcebral functions, and as varied in their nature as they are varied. Discharges. in motor realms will thus afford endlessly diversified combinations and nequences of spasses, whilst discharges from sensory realiss will likewise implicate correspondingly complex centres. The former are opento objective study; the latter, as being purely astirctive, our only be gleaned by information given us by the patient. Again, local discharges initiated in motor realms may apread to other motor areas or, from being of hemispheric origin, may become bilateral in their distribution, or speculing backwards into sensory realiss and the highest and most complex of centres, issue in loss of consciousness. As regards this implication of consciousness, "all depends on the momentum of the discharge, and, therefore, on how for it spreads " (Mughlings-Jackson),4 In like manuer may arise pure sensory epilepsies, with, or without, loss of conscisusness in the full acceptation of the phrase; or a primary sensory epilepsy may spread into more purely motor realms, and impe in general convalsion, the discharge, as it were, being reflected on to the motor sphere. We thus see how infinitely varied may be the resultant of epileptic discharge from any unstable area of costes. In undaterally commencing convulsions-vir., those size to local discharges in one benisphere-we can usually trace the spread of the discharge with facility; this is, however, not the case with the epileptic seleures associated with mannity. Here we more frequently observe attacks of petit mal, or else that form of grand mal, in which the loss of counciousness is early and complete, and the arrest of the discharge so rapidly general that the whole body is almost simultaneously affected by the convulsion. This rapid rundown of mechanism, comparable to the rapture of the mainspring of a watch, renders it impossible in most cases to distinguish any sequence in the resulting spanus. It is truly a uniconsol spane, or, to use Dv. Hughlings-Jackson's vigorous phrase, "a clotted mass of movements." In like manner consciousness is then lost at so early a period, and this so endelessly that the patient falls instantly, as though struck senseless by a blow.

The discharge from sensory areas cannot, from the very nature of the case, he followed; we can only learn the existence of an aura by the subsequent statements of the patient; but—impressed only by the results of the meter discharges, we must not lose eight of the fact, that equally powerful discharges, of which we see no result, may puss along sensory areas at the period when consciousness is abolished. Undoubtedly the muscular spaces are likely to attract to themselves union attention on the student's part; and he forgets for the time that still more movious effects are being produced in the areas of mental and sensorial activity silently and concealed from his view. It is, therefore, all the more important that one should keep these unseen results in mind, and watch carefully for each evidence as may arise of the implication of the sensory portion of the brain, for such evidence is forthcoming at certain stages of the affection.

It is very obvious that amongst a large number of epileptics in our asyluse who suffer from mental derangement, there is very great divergence in the history and progress of their affection-the phonomena of their disease by no means present a fead uniform level. Some remain immates for very many years with the intellect but little impaired, and then only at those periods when they become subjects of epileptic semmes; others (with few, if any, convulsiveattacks) betray at long intervals periods of degression, of moroseness, or of excitement, during which they are more or less irresponsible for their actions; yet, in the interim, they are perfectly rational, cheerful, amiable, considerate for others, and obliging. In others, again, the mind becomes rapidly enfeebled; and during the period of their "fits " the reductions are so profound that shoulde dementia and stupor, or perhaps wild ungovernable fury, prevail. And, yet sgain, with but little essential difference in the motor disturbance of two cases, the wreck of mind in the one may stand out in strange contrast with the elearness of intellect in the other. The resulting dementia therefore (so-called "effects of the fits") varies very considerably in degree, so that each individual case may be unlike the others in this respect; and this is undoubtedly dependent upon the varying seat of the primary discharge from the cortex. To quote Dr. Haghlings-Jackson-" From this it follows that there is, scientifically speaking, no entity to be called epilepsy; but immmerable different epilepsies as there are innumerable seats of discharging

lesions. And as the first symptoms in the paraxyam is the first effect of the discharge of the centre unstable, any two paraxyams beginning differently will differ throughout, however hitle."* From all this it becomes sufficiently obvious that we must not rest satisfied with a mere observation of the motor discharge excesplified by the convulsive science; but, we must likewise question our patient closely upon his semuations and mental disturbance inmediately preceding the loss of consciousness, and observe closely his condition as presented after the paraxyam and up to the full re-establishment of conscious activity.

What are some of these indications of discharges in account realism? A patient at the West Riding Axylam after each severe attack of fits becomes completely filled, and gropes about on hands and known-epileptic assaurants is, however, an infrequent effect of this disease.

Another epileptic becomes hemianesthetic on the left side of the body after certain convaluire seizures; and this saesthesia is attended with a corresponding state of the retinal fields; there is left homogymous hemisnopols, associated also with impairment of the other special senses of the same side. Indications of discharges in senary realms are afforded during this stage of re-energising, by the champing movements of the jave, with corresponding movements of the tongue, probably indicative, so has been stated by Ferrier, of discharges from the centre for taste, the maximenta being thus reflexly induced. The rubbing of the hands together-the attention of the patient evidently being attracted thereto-probably means that mortial sensations are referred to those parts. A very frequent action amongst such patients is the rubbing of the open band upon the know, or the slapping of their thighs with the palm of the hand. We must, however, be careful to avoid arriving premuturely at a decision, that this is due to discharges in semory realms, initiating the movement; it certainly may be due to a more complex mental state. Thus one intelligent patient explained this action, of which he seemed conscious, by saving, that he did it because he thought he could "bring himself by this speams more rapidly out of the fit." Discharges from the substrata of visual sessori-motor areas of the cortex will often be indicated in festastic movements of the hands, as though the patient were disentangling imaginary skeins of thread in the air. Other subjects, and these are by no means infrequent, appear to be following imaginary objects on the floor, or peer in some one direction; or, again, scrutinise with incessant vigilance the floor and furniture around them, as though searching for some lost object. With all this there may be considerable mutor automation; the subject may climb upon tables to the window-tills still searching apparently for some object; or he may remove his cost, turn out the contents of his pocket, &c.

One of our patients invariably after his six empties his pockets on the table, scores his pipe, and placing it (although empty) in his mouth, marches to and fro with a self-astisfied look and contented mice.

All cases of epileptic insanity should be rigidly studied with a view to (1) eliciting the condition of mind immediately preceding an attack; (2) the essential features of the epileptic seimmen; (3) the subsequent period of reinstatement of consciousness; (4) and lastly, the mental atate prevailing in the period intervening between the "its." We, therefore, divide our remarks under the headings of—Firstly, the preparexysmal stage; secondly, a premountary stage (often absent); thirdly, the parexysmal stage; Sourthly, a post-parexysmal stage; lifthly, the interparexysmal period.

1. The Preparoxysmal Stage. - The spileptic instancare especially prone to exhibit indications of an approaching solute; nor is this surprising, when we recall how slight departures from the normal state of healthy cerebral nutrition betray thouselves in all our subjective feelings and moods. The grave nutritional anomalies upon which an explosive neuronis depends might well be expected to declare its advent thus-subject, of course, to the special site of autritional derangement. A change in character is thus frequently recognised during a period of hours or even days antecedent to a seizure. An able and intelligent attendant will to study his cases, that he at once detects the little minor changes in the patient's disposition, indulges his whims, endeavours to sooth his morbid irritability, and supecially guards the subject at this period from unnecessary annogances. Thus, we frequently hear excuse made for some patient's lapses of temper, or unseemly behaviour, "Oh, he's just going to have his fits, sir, he will then be all right." In asylum life, amongst the intelligent class of nurses, the fact is universally recognised that a premometry stage of great irritability is often seen, and the effect of a convulsive attack will be to clear up the mental atmosphere.

The mental disturbance thus preceding the epileptic paroxysis presents very variable features—(1) melancholic gloom and despondency may prevail; (2) hypechondriscal perversions, which may have been persistent during the patient's interparoxysmal stage, may now become exaggerated and intensified; (3) restless, objectless wandering may indicate the measy discontented mind; and the subject may complain of this arrest, of being mable to follow his much compation, incapable of keeping his mind upon any subject long together; he cannot ressi; his sleep fails him; he becomes indifferent to his meals and inattentive to his wants generally; (4) a copic dread of impending evil is occasionally expressed; but this is more frequent as a genuine som—a psychical state, the immediate accompanionent of the commencing spileptic discharge; (6) joyens station may precede an attack, a general state of optimism be present, often associated, however, with gross agolatical sentiments; (6) confusion of ideas, diminished signer of attention and memory are also peculiar to this stage; this is the first symptom, for instance, betrayed by an epiloptic compositor employed at this asylum; with him there is also at this time a notable degree of irritability and irrepressible garrulity; (7) delusions of ampicion are a prominent feature before spiloptic solutes in certain of the instanc, and may form the incitants to acts of dangerous or homicidal violence.

An insules of the West Hiding Asylom almost invariably betrays to his alteralised this state of mind; he stable up and down the words, meanes a definit attention and bearing to all around, keeps a vigiliant eye upon each power by; and consistently bedwing the attention, reveals to him privately the statement of an imaginary compliancy to poison him. This paraset wholly spaces the fact that he has \$15—"Oh, they say I take \$15, you know "pirth as incorpolates senio;" but, I know what alls me;" send then with a mysterious ar—"What they per in my food and melains explains compiling." At these in openly access the doctors of drugging his food and think, and energy is the may proceeding convolutes. In this preparaty and stage, depression always pressals; this convolute minute comm, and as the attendant emphatically and truthfully amorts—"his is then a new man." This patient also indicate in our word of the effects of the poison by drinking his own arms, which he has been detected doing on more than one common, and with this account object in view.

2. Premonitory Stage, .- This is not truly a stage, but the first period of the parexyon itself; yet it is convenient to emaider it separately in accordance with the old notion of the phenomena, the so called was sings or augas. In fact, the phenomena embraced by this period, the epiloptic axes, are but the subjective aspects of the nervous discharges in cortical centres, the initiatory emptons proceding that less of consciousness which leaves the remainder of the enculsive paroxysm snices a positive meanal counterpart. For it must be remembered that in all these excessive discharges along highly specialised conseri-motor mechanisms the subjective phases are of but transfent duration, only during the earliest period of the attack; the objective are obtrusively present, but from the early failure of consciousness have no mental correlates. Since, however, the spileptic nors constitutes the errical symptom of the aroul discharge, when correlated with the physical accompanionents of the attack, it facilitates our comprehension of cerebral activity, and the parallel series of psychical manifestations. To the student of psychology it is of intense interest, and should be studied with the greatest care.

And, in the first place, since any of the regions of the cerebral cortex (which are the austomical substrata for all forms of conscious activity) may be the site whence an epileptic discharge originates, so the phenomena of an ones may be co-extensive with all forms of sensation whatsoever, and may even be constituted by more elaborate forms of psychical activity. The sensation constituting an aura is, therefore, referred to any portion of the environment, including in the latter term the body and its organs generally. We thus may get some of—(1) the special senses; (2) of the vaccral or organic sensations; and (3) intellectual or psychical some. A few remarks on these sensations will render the subject cleaver.

(a) Special-Sense Aures. It wint be remembered that in the five special senses-taste, smell, touch, hearing, and sight-we have an ascepting scale of semutions entering more and more intinstely into connection with our intellectual life. Taste and smell have the least intellectual element, and are specially characterised by their slight recoverability in iden-i.e., in persistence or capability of being recalled in the absence of the object; although both are capable of much improveshility by education (Burn). On the other hand, touch is a much more intellectual sense, highly discriminative as to locality, and capable, in conjunction with other senses (and especially the muscular sense), of giving us ideas of the form, dimensions, and position of objects in general; its emential intellectual factor is dependent on the conjoint agency of the muscular sones (Sais). Hearing and sight attain the maximum as regards intellectuality; are highly cooperative; exquisitely discriminative in their powers; highly persistent and recoverable; us well as capable of almost unlimited education. Sight is, of all the senses, pre-eminently characterised by the faculty of objectivising, and in fact enters much the most largely as an ingredient into the constitution of object-consciousness. the other hand, at the further end of the scale, the sense of taste and of smell (and still more notably the sensations of organic life) are characterised by their inherent subjectivity, or the greater difficulty experienced by us in discriminating between subject and object. The drift of these remarks will be at once apparent to the student when he considers that the least discriminating and most subjective of these series of sensations (the organic or visceral and taste and smell) have least connection with the intellectual operations of the mind; the most discriminating and most objectivising (the high or special senses) have intimate connection with the intellectual operations, and that, Morefree, name, consisting of the former sensations, must be referred to the implication of the substrata of the crude sensations of organic life, and the emotions-those of the latter-to the substrata of the highest activities of the mind, although they also enter into the emotional life. of the being.

Organic Sensations,—The innumerable impressions which must arise momentarily and co-instantaneously throughout the organism during the healthy activity of all its tissues, its muscles, bony framework, viscera, and vascular apparatus form in their aggregate what are termed the sensations of organic life. Many of these, such as the visceral and wascular, have phases of "unfelt" sensations, or, at least, sensations not discriminated from the vast mass of sensations created by the functional activity of the body at large, with periods of emphatic expression—e.g., honger and thirst. The "unfelt" sensations, however, rise into prominence in meebid states of the system, and we then get those intersified organic sensations, which cause much discomfort and contrast with the normal massive feeling of bics-ites. In the spileptic, likewise, we get such sensations around in the organic aure; they are distinguished by the massive and all pervading character of the sensation. We may take Professor Bain's classification "as embessing these sensations of organic life, which are thus liable to derangement:—

SAMPANDON ARREST PRINT

(T) Muscles.	642	Organical	of carculation
(f) Pener stal ligarerals	450	46	respiration
(3) Nerves and assess renture	191	100	digestion,
To which we may add the of the	William	insultors	- absaratos

Finest Jures.—These occasionally precede the seizure in epileptic insentry, but, as pointed out years since by Sir J. Crichton-Browns, aures are not of frequent occurrence amongst this class of epileptics.† When they do occur, the visual nurse consist usually of crude sensations, balls of fire, coloured light, glattering sparks, &c.; thus G.J. sees a number of sparkling stars before his eyes, all around "looks dim," and if he holds a book in his hand, ere it falls "the letters all run into one another." If has a warning described as a doubling of objects around him, as if by "cross sight," meaning that he supposed it was due to a transient squint. Red and blee are the colours more frequently sees in these visual name (Georges).

Authory Warnings.—These are less frequent than the visual; but are occasionally met with in elaborate form. Dr. Ross speaks of hissing, singing, or explosive noises; of a noise in the care, followed by vocal utterances, in access cases of ordinary epilepsy.; Dr. Gowers speaks of a create, a whize, a him, or whitele; or an the other hand, a loss of hearing, strange stillness preceding the less of consciousness. These are rarely recognised in asylum epileptics. Consciousness, as a rule, is in them too early lost for these phenomena to-occur.

Gustatury and Offictory Juris, ... These are the least frequent forms of aures met with in opileptic insanity. In the patient J.F. the convaluive actourse were invariably preceded by such affections of the sense of tasts as would justify us in regarding them as gustatory

^{*} The Senses and Jobisbert, Alleman by Balts-14 Semailions of Organic Life."

^{*} Wor Raling Justine Medical Separts, 105, 15, p. 160.

² Discours of the Norman System, vol. 14, p. 919.

aura. The intimate connection between the sense of taste and that of smell renders the differentiation between hallucinations of these senses dubious, and at times impracticable. We must carefully exclude the instances of perverted semihility which so frequently engender sense illusions in the egileptic subject, giving rise to deliminus of being fed upon busian flesh, or similar revolting notions.

Pass Motor Aure.—This form is exemplified in the case of a patient whose fits are always preceded by unilateral was motor disturbance marked mottling of the skin of the palm, susceinted with morbid sexuations; the patient invariably opens the hand and inspects it critically, turning it over and over again, and feeling the skin with the fingers of the other hand. Consciousness is then lost, and the arm so affected becomes convulsed.

- (b) Viscoral or Organic Aurm,—These are the more provalent nonautions recognited in epilepsy, as stated by Sir J. Cricken-Browne.* The feeling is one of weight at the epigastrium, or a fulness or distention of this region. This feeling eften rism to the threat, causing a sense of great disconfort—the patient beginning to pull at his collar or necktic as if to loosen it. Occasionally, the sensation croops up to the break, becoming, as one patient described it to me, "an expansion or swelling of the head—an opening and a shutting." Again, the epigatric sensation may be one of actual pain, which remains until consciousness is lost. Another very frequent symptom of the onest is that of a sinking or of actual pain in the peacerdim, or violent pulpitation of the heart. A feeling, identical with the globus Australia, is also very frequently observed in epileptic insanity (Genera). All these sure, it will be noted, are referrible to a centric disturbance of the vagus and spinal accessory.
- 3. The Epileptic Paroxysm.—This paroxysm may be characterised by the predominance of the mental or motorial implication—that is, we may have transient, though complete, loss of consciousness, with little or no spasm; or the general convolutions may be the position of feature, accompanied by early or later loss of consciousness; and since every shade of interlibending of such phenomena may occur in different subjects, so no sharp line of demarcation can be drawn between the two extreme limits. A not infrequent symptom of the approaching attack in a non-painful contraction of the fingers of the arm first affected. Thus one instance, amongst several, invariably has a painless flexion of the fourth and fifth fingers of the left hand with a cromp-like swelling of the right sterno-masteid muscle which warms him that the fit is about to occur. These meaning cramps preceding epileptic sciences appear very frequent previousnas amongst the epileptic issues community. Classically, and for convenience of

description we recognize the two forms, called respectively le grand mal sod le petit mal.

(a) Grand Mal, -An aura may or may not precede, and the peticul, if standing may, without any warning, stagger to a seat, or fall enddenly down on the face or back, aften regionaly injuring himself. There may be the "epileptic cry," which is very frequent amongst the epileptic instance. It may comist in a subdued, plaintive wall, or a load, wild soream, or a succession of piercing shricks, as though the subject were setuated by terror; at times it is a more house gurgling in the throat, or a loud, prolonged grean; all probably due to the sulden foreible expulsion of air through a constricted glottis during the tonic spasses. The face is now deadly puls, the pupils dilate widely, and consciousness is completely lost. The convulsions beginning by tonic spasm, usually cause conjugate deviation of the head and eyes to one side, to which the body tends to roll; the spaces is usually more marked on one side of the body than the other; the chest is fixed, and respiration being arrested, the face becomes now injected and livid-the tonger, congested and swollen, is often forcibly protruded from between the teeth, the veins of the neck are awollen and rigid, and intenso evanonis prevails.4

The position of body and limbs will vary such in each individual case, depending upon the origin of the centric discharge, its strength and spread to collateral parts. Flexion and extension may be comhined in different limbs-or flexion prevail throughout-the body being drawn up into a state of suprosthotones. In the latter case the patient, if sitting or standing, almost invariably falls forwards; atother times the head is atrongly drawn luckwards, or luckwards and to one side, so that the subject is twisted round in his chair as if looking over his shoulder. The tonic spann now gives way very gradually to cloud convulsions-froth fearer from the mouth, often tinged with blood, the tongue having been caught between the teeth and bitten by closure of the jaw; the fine vibratory character of the movement becomes coarser and broken up into rapid rhythmic movements, which eventually are large, interrupted, and cease entirely after a few irregular shock-like jerks of the limbs. The closic spanns har from half a minute to two minutes, and after this emantion the patient lies stupefied and breathing stertorously. This, the third

^{*}Probance Believers has given the results of experiments augment by him to Dr. Todorski, in which it is clearly proved that during optleptic serious, actionally induced in animals, the toric period is characterised by an innerse of bleed pressure at both central and peripheral orde of the carotide, as well as in the jugular runs; whilst, is butter experiments, it was shown that the pressure of the cerebro-spiral dust always equalled that of the carotide. During the Dr. there is always as increased flow of arterial bleed to the brain.—Nuovicytiches Controllets, No. 33, 1894.

period of the fit, is very variable in duration, lasting from a few minutes to as many hours. There is a gradual return of normal breathing; sensibility and motor power are regained, and, with the exception of some heaviness and a dazed feeling, the previous condition of the patient may appear perfectly re-established.

The sendition of the deep reflexes following upon these epileptic sciences is of interest. Certain sciences are invariably followed by exalted knee-jeck, and also well-marked ankle closes; the closes may be established a few minutes offer the fit, or may succeed immediately to the convulsion. We have noted this immediate establishment of slowes also in cases of general paralysis, and, in one instance, in which severe epileptiform convulsions preceded by a cry affected the right arm only, excessive closes existed in both ankles, but was most marked on the right side, the convulsive sciences being frequent, but of above duration, and followed by very prolonged unconscionness. In contrast with the above there are other instances where the kneejerk is completely lost after a severe fit, re-appearing again slowly in the course of four or five minutes; in such cases closes is not observed, and the post-epileptic stupor has been prolonged and preforms.

(5) Petit Mal,—In these attacks there may be nothing observed beyond momentary loss of consciousness and pallor of face. The patient may be sitting or standing during the attack; he does not fall. He may drop what he holds in his hands, or be undenly arrested in movement, but may instantly recover himself, and not as if nothing unusual had occurred. Exquired relates the case of a lady equestrian who had frequent attacks of petit und when on horseback, yet never fell off. There was momentary arrest in her conversation, the bridle dropped from her hand, but, in a few seconds, also had recovered and implied the contenes interrupted by the attack. Very often the face, anthesquent to pallor, becomes flushed (Govers). In these slight sozumes there may be slight facial spans—the expression is momentarily fixed; or a space of the hand may occur, or a more noticeable (but limited) convalues of very transient duration.

One of the permonitory save, before noted, with some vertigo and reciting may constitute such an attack. A patient may be subject to such attacks for years without a single scirure of grassi and occurring, or three two forms of apilepsy may occur indifferently, now one unit now another, in the same subject—or attacks of grassi and interspersed with the union offsack, may gradually predominate and eventually wholly replace the petit san!. Thus one of our patients at the West Riding Asylum, subject to each scirures, was, while sitting up in tedous meeting, requested to write his reply to a question; he wrote a lengthy answer, interrupted by some four or five such attacks. There was momentary loss of consisonance—the lossi drooped slightly, the pencil slipped through his flagers, but was almost instantly regained, and the sentence was continued without any apparent disconnection of words or displacement of letters; the interruption was so slight that, if he had not been closely watched, the condition might readily have been overlooked. In the case of this patient, a better might have been essily written by him showing no confusion of ideas, and consistent in all respects, during a frequent repetition of such slight estures as the above; and, in a medico-legal sense, this is of the utucest importance to recognise. At the same time, these slight attacks of spilepsy are well known to issue in the most rapid impairment of intellect—a fact recognised long since by Exquirol. This is because the disease is of the "very highest nervous arrangements in the whole nervous system, and of those which have the greatest integration, that is to say, of the substrata of conscionances" (Hughlings-Joshon).

4. Post-paroxysmal Period .- It is during this post-paroxysmal period that much valuable information may be gleaned, as the mental automatism then displayed is in many cases prolonged, and affords us the opportunity of exceful study. Epileptic mania of transient dreation is a most common result of the paroxyme, but it is by no means always of so fleeting a nature. Cases occur where the maniscal excitement extends over many days without any further epileptic seizures intervening. It apparently bears no direct relationship tothe severity of the attack, or to the number of epileptic scinures; itmay follow slight sciences (potet esol), just as it may be the sequel tothe major convulsive attacks (grand soil), and a single "fit," convulsive or non-convulsive, may beave the patient in this meniscal condition just as frequently as a succession of such attacks. This want of connection between the spileptic paroayan and the occurrence of a manuscal cuthurst is perhaps more apparent than real. We are apt to lose sight of the fact that the slightest seizures are just the very cases where consciousness is prose to be most impaired or involved, and where a sensure is most likely to be whally overlooked by the friends or even the patient himself; and thus it happens that a paralysis of the reastral hierarchy of the nervino system may so withdraw control over lawer centres as to issue in wild excitement, although the endeptio seizure was so slight as to be scarcely, if at all, appreciable to the onlinerer In like manner the major discharge, if it starts (as in cases of insanity it most frequently does) from the highest cortical centres, may also leave these parts so punifysed as to result in a post-epileptic maxim. One single attack may suffice for this issue; all depends upon the site of the disease being in the realms constituting the cerebral substrata of consciousness, and hence the vital importance of noting whether in

our cases consciousness is lost completely or only partially, and whether early or later in the course of the parentyme.

The stinck of spileptic mania is usually highly characteristic in all extreme cases. The excitement is most acate, attended by almost ungovernable violence and fressied fary—no maniacs show such blind, uncalculating fury as the epileptic. On this account he is one of the most dangerous subjects we have to feed with in our saylune, for the attacks often occur with slight, if any, warning, the signal first given being often an attack of brutal and impulsive violence. The aspect of the patient fully accords with the impulsive conduct; he is usually pule, glastly, the eyes staring vacantly, and the face expressionless or betraying wild and passionate emotions. There is much incoherence, yet often the patient otters not a word, but struggles wildly, rushes modily at his attendants, and appears wholly oblivious to existing comfitions around. At these moments he is in peril to himself and others; and smirilal and homicidal acts are not seldem accomplished under such circumstances. Occasionally some leading like, usually a delusional notion of persecution, is expressed by the subject of this mania. It was before stated that a delusional state frequently precoles the attack, becoming very apparent during the last few hours of the pro-paroxysmal stage. In the state of epileptic mania such delusional perversions are very likely to re-appear, and to prompt the subject to deads of violence. There is a tend-new apparent after epileptic seizures in the insane, for consciousness, on its relinitatement, to be occupied immediately with the subject-matter of thought preesling the attack, which means no more than that certain nervous currence established just upon the onset of the seizure are liable to be re-established immediately as consciousness is regained; what was most vivid to the patient's mind before the "fst" still remains most sivid when the attack is over. Thus, a question put to the subject and replied to, just before a convulsive seizure, will often be replied to again immediately at the first look of recognition on regaining consciouness. A female epileptic, e.g., saled her name, replied, "I am Annie Thernbury," immediately fell in a fit, and, on regaining normal consciousness, looked around and said again, "I am Annie Thorabury." An epileptic lad, asked his name and age, replied, "Sixteen years, Samuel Speight"; he thereupon turned pale, uttered a load cry, fell to the left side, the head and eyes turned to the left, the left see was extended and convulsed; he then turned over upon his face, and convulsively moved his left hand wide spread, sa though scrubbing the boards. On regaining consciousness he sees to his feet, and isolding straight at us, said. "Sixteen, I am Samuel Speight." So also in the case of E. C. in her naturantic endeavour to pull out her hair (see p. 271). We mention these cases more particularly because they appear to us

often to afford a cine to the persistence of a delinional notice, which, being present in the pre-paraxysmal stage, may rise into being in the post-paraxysmal period during the reductions of this stage, and issue in immediate action—suicidal or homizidal attempts. In the stage preceding the seizure, they may have little influence on the subject's conduct—he then retains at least his normal self-control; but during the automatic stage of post-optisptic mania they may be of terrible import.

From a medicolegal point of view, we cannot too strongly insistagen this feature, that leading ideas, delesional to otherwise, provailing in the pre-paracysmal stage are likely to become operative in conditions of pert-epileptic saturation. Wild, delirious excitement, after fix is more frequent assengst somes than men; they lie awake all night, chanting aloud a song or smood air, batter their bedroom doors with their hands, meet one with defiant glance, and are utterly reckless of life or limb if interfered with. Fortunately, their very reductions in consciousness present them from providing against tact and address on the part of an able attendant, so that they are readily overpowered and managed in most cases.

Again, the accusal passion may be highly evoked and certic conditions prevail in this post-purosysmal stage. One of the most instructive instances of this at the West Riding Asylum was the case of an epileptic lad, who exhibited, as an invariable sequence to his epileptic secure, the most frantic outburst of satyrissis, immediately succeeding the convolutes stage; during this authorst, seclasion was impossible, to accure his follow-patients from indecest assaults. In the interparoxysmal periods this patient was a well-conducted lad, devoid of abnormal prunency, and was a striking illustration of the importance of recognising this condition as the outcome of spileptic reductions in a certain class of subsects.

It is not, however, all cases of epileptic manin which exhibit these wild and debational states. Some subjects remain incommutely garratoms, and memble in an incoherent and utterly absurd strain, often poor into one's face with a scrutinising look, or arrest the passer-by and address their irrational occurrent to him, but show no signs of vindictiveness or passion. Some betray their excitement by incongruous and manesaning gesticulation and gramace; others by increasast pacing up and down their rooms, exhibiting strange and factoric manneriums. One epileptic female in this stage invariably hastern down the corridor of her ward and kisses the pictures hanging to the wall; another is found kneeling with clasped bands before the bests and pictures. A case of spileptic indecility in whom the fits are now very infrequent, even twelve mouths or more elapsing between each observed seizure, has a single attack of convulsions one night, and

suffers from epileptic excitement for a fortnight subsequently. She lies in bed in a lendified heap, covering her head with the bed-clothes, scattering incoherently. When disturbed, she utters an unintelligible jargon, interspersed with curses, and, showing her teeth with a force, sindictive look—half snarl, half grin—plunges beneath the bedding. In some cases, but rurely, the neute maniacal excitement sets in isomediately upon the cassation of the comatons stage. In the case of a compositor, already alluded to, in whom garrality augured an epileptic science, excitement has followed for a period of some eight or ten days. During the attack of spileptic manta he would wander assubstally to and fro, or perform peculiar gyrations, talking inconstraily in a load, declaratory manner, and indulging in a rhysning propensity carried to a ridiculous extent.

Hysteroid Attacks.—Those are not at all infrequent accompaniments of the epileptic seizure in the insure. Of those attacks Dr. Gowers says—"Instead of presenting such automatic action, some patients pass as already mentioned, into a state of violent hysteroid convulsions. This sequel occurs cheefly at the age at which hysteria to not with, under thirty-tips. It is most common in young women, frequent in boys and girls, occasional in young men. Hence it is oridently the result, not merely of the preceding epileptic fit, but also of the presence of the cerebral state which underlies the manifestations of hysteris."

Daniel K. C.

The rand remerkable case we have not with occurred at the West Hiding technic team fearness parts ago

It was that of a young woman aged twenty-right, and single, who confirmed for sixteen mouths make our observation, and who for the first twelve mouths was entjoyd to optioptic and hystograd seamon, whilst claring the lattice tour mouths also was completely free from its, and was discharged morrored. Her minutes seamed with great regularity every three weeks, and hasted from three tour days—the contributes minutes commuting both night and day. The symptoms of the second stages were thus distributed.

Proposogues' Stay, —For some days before a telegra, noticence, irretability, a puls and article both, depression respecting to despondency, and much insurate, were model. Then experienced a sotable predictivity of manner, and also confound to simplifications, via. —a view repeatedly calling not. "Bill them! bill them! So was at this time distinctly minished and leminished in her impelies, and always proopsised that the "first were peopling when the planesement were control. Occasionally, without a science, the new bearing very risdom and distinction.

Proceeding Period - Restlement more urgest, the "voice" more imperative, then the sensations of "a clock" within the head "sensal up tighter and tighter," when all becomes dark, and commonster is abeliebed. Asked afterwards to describe the "clock," she defined a circular every about 4 inches in discourse. and is a dericental plane around the vortex of the head; and able that if her hair were cut off also befores it would obvious the night feeling of the winding. [Her for entomole art after an actual minor is that of pulling our for here,] Associated with the "voice," she consistently hears bells ringing, and has a feeling of pricking pain within the sychalls. His never refers to her consolid impulses or to the "voice" which prompts has to the set until after the science; but, she often refers to the clock is it begins, crying out, "The clock," "the clock," and then becomes anomalies."

The previous was irrestably estable for the following feature :-

- (a) Deliterate rise of temperature and quickened pulse during the quarter of an hour proceding the fit.
 - (ii) Peculiar recurrence of corresponse estructs in series of threes or sixes.
 - (2) Extraordinary periodicity of both diagnal and posturnal sources,
- (a) Post-epileptic automation replaced by hysternal science removably; so by wild epileptic masis with determined saidful or hospital impulses,

The rise of temperatury boundly amounted to a digree above mirrul, sententially higher; the pulse after rising to 130 before less of consciousness; it was also possibler in the fact that when the movednism was accounted by chircal, the case in framerators shit fool plays, and became over more mirked when the fit was their suppressed. The situals of convulsions presented two varieties—in one, —asseeming almost simultaneously, and occurring bilaterally; in the other, beginning on the right side and operating in the left, " Under twitching of right angle of enough ; the head drawn should to the right oright arm affected by chem quantthen the left arm and hand a symballs drawn appeareds a the feet raised from the floor, the left fact, then the right, both right and quivering. Whole fit lam-d about ten seconds, and terminated unbliculy with complete mancalar flaceality," Agother series of absocks is then described. "Twitching of both eyes and might of morth; then clean squares of both areas and logs, a preliminary fred; square haptly observed; wext, more opions of the sheet provides with a load service; surveyed classe queens prelimities of muscles, and \$1 over. These a six such attacks over in encousing, the last always followed by closure of the epoc, which throughout the actuals had been kept open." Then after three or more manutes? calm the hystoroid uttack occurred; the even special andfordy, staring excustly, the boad was drawn rigidly tack, the body arched backwords in a position of equations on the about fifteen to thirty seconds; then the head was thousand a builty bewards and backwards several times, and a wrone struggle entered in which she had to be facility restrained by several curses to present her rushing to the window or injuring herself or others. When watched insknown to herself) in the publish room at might, the same stracks occur, and in the succeeding ignifercid seguire into body has been toured from real to real of the most against the pade by the richers of the contestions; her behildhes also, after each attacks, were invariable turn to shreds,

The epileptic secures above described maintained in extraordinity periodicity in their sequence; such series of the almost invariably taking place at about the same loans throughout both day and night. Several features of the rase would naturally suggest a parely bysterical origin for such an attack; but that the assumes were precisely epileptic associated with sequent hysterical secures, was continuously above by associated conditions which were availably powers; three were —(1) initial rise of temperature and pulse; (2) arm of the "clack" followed:

^{*}This case, of which the main features are given here, has been published in detail in the Bast Balloy Aspiner Durent, vol. vi.

by interest pullor of face; (3) extreme dilatation and inequality of pupils, the right always the larger; and (4) well-marked systagenus.

The number of epileptic attacks occurring in this subject varied from 80 is 180 (both sky and night), and these became somewhat her frequent and less sovers towards the fourth or 80th day as the termination of the attack approached. The following acts made by the writer at the time illustrates the thermal disturbance proceding the attack a rise of temperature occurred of 1' to 1.2' Fafe, and at the struggle a still further rise, often in the entert of 1', or two times. The temperature thus should full again to 88.6', and on one position as low as 89.2', except when two fits encounted such other quality. On the constraint of six energies, the total obstation of temperature recorded was fully 2.2', slowly falling to 99.2' string the following four and a half. The permission of six energy is to severally severally fits rise accurring before the fit; but at the secont assume a class of the permission of chiefs in remembry severally instead of a convolute witness, there was nothin probabile step stell a rise of about in tenths of a diagram."

Another possing phenomenon was noted after the convulsies seitures had ceased and whilet a still shidded, pettish mood prevailed, with distinct alicenties. the temperature taken at periods corresponding to the time of her fits was found from structure on 1 8' above normal, although at other percede of the same day not corresponding to the issue of a fit) the temperature was BHC. "As these periods arrived size would become greatly depressed, often starting up and wasplaining to the surse of her low quints." At these times faithough naturally an melligent, bright, and cheerful young women she would remain for days subsquest to the attack, children in her payonts, would make drifts' cicting, and loadle a stell like a child not out of her tenor; was exprisions in likes and distings, petrick and ill-housemed. This case illustrates in a foreible manner most of the very variable features of epilicysty. The premonitory depression; the tendency to distinct mental observation; balluctuatory phenomens; the sum, epileptic, hysteroid and catalogue states; impulsive homissful and unicidal violence; and the resultant mental inductions following the more marked post epileptic unto matic stayes.

Epileptic Katatonia.—We may here advert to meet of so called katatonia—a term intended by Katilhann to include those unitiple symptoms of stupes, cataleptiform, and costate states, with phases of dumbness or resterative speech—all running a certain cyclical course; and, according to this author, constituting in their exceeds a distinct merical entity, as characteristic as general paralysis. Such symptoms are not infrequent in epileptic insunity; they especially prevail in the mental alternation of puterty and adolescence, in the pursperal forms of insunity, and are closely associated with the vice of omnism. The more closely we study these cases of knistonia described by Kahlbuam and other writers, the more convinced are we that we are dealing, not with any distinct pathological entity, but with some of the multiple phases of hysteria. Melancholia attenita closely approximates to the states to which we now allude.

Status Epilepticus.—The very extraordinary periodicity of the attacks narrated in the last case is, of course, exceptional; yet a wellmarked tendency to the periodic neturn of epileptic scirares has long been recognised, and especially emphasised by Reynolds-"A large number of opileptics have their seiggres every day, every two weeks, three weeks, and four weeks, while only a much smaller number suffer at such irregular intervals as cannot be thus expressed." This opinion can be endorsed by all who have had acquaintance with epileptic insanity, for it is undoubtedly true that these subjects exhibit a notable degree of such periodicity. A periodic recurrence is more frequent in the female than the male; but this is attributable to the associated menutrual derangements as often connected with the epileptic convulsion. The number of seitures varies greatly in some individuals; an enormous number have been recorded within shortperiods of time; thus a patient at the West Biding Asylom had 1,849 convalsive attacks recorded in a period of fifteen days; and Delasiance mentions an epileptic who had 2,500 attacks in one month.* In general a patient has one, two, or three attacks during the day or night, recovering full consciousness between each science, possibly passing many days before a recurrence.

But if the attacks succeed each other rapidly, and consciousness benot restored between the convaluive seizures, if fit succeed fit at intervals of a few minutes only, the patient remaining comatose, we have developed what has been termed the epileptic status, a condition of most serious import. The pulse and breathing become quickened, and, so Bourneville first indicated, the temperature rises to 105" or 107", with deepening come and sterior; the patient is liable to sink. As the fatal termination approaches, the convalsions become more frequent, a few accounts only intervening between each discharge, so that at times they appear almost continuous, a fresh discharge being only recognised as a slight increase in the intensity of the convulsions. When this period arrives, however, the epileptic discharge becomes progressively feebler, and the fit may be characterised by a slight turning of the head and eyes to one side, with slight clonic movements. of the links, or seerely convalsive twitchings of one side of the mouth without conjugate deviation. The conjunctives are, of course, quite insensitive, the pupils being widely dilated and fixed to the strongestglare of light, while the face and body are bedewed with a cold sweat. Often the temperature exhibits uniluteral doviations, being highest, by a degree or more, on the side first (or most) convulsed. If the patient recover, the fall of temperature is most sapid on this side until a balance is established; and subsequently, an equable and continuous decline of temperature proceeds on both sides. Many epileptics are subject to these occasional outbursts of convulsions passing into the status, these cases an observant medical officer soon learns to recognise, and experience teaches him the necessity of keeping them for prolonged periods upon bromife treatment. In the section on treatment of epidepsy we shall deal with this serious condition in detail; suffice it here to remark, that prompt and vigorous measures must at once be adopted if we wish to save our patient's life. The mortality from the status epileptieus is said to be due to (a) collapse, and (b) meaningitis, the fits coming, the patient becoming delirious, developing bed-sores, &c. We cannot say that this latter termination has been seen by us; the mode of feath has always been, according to our experience in asylum practice, exhaustion with hypostatic congestion of the lung,

Epileptic automatism, of a most elaborate kind, is a prominent and often perilous feature in some epileptics after their fits; its interest as a medico-legal question is great. Thus we constantly observe patients at this stage perform not only the most incongruous acts, but carry out what would soon to be complicated purposive acts, to which they are entirely oblivious on return to normal consciousness. They will pick the pockets of fellow-patients; purlois articles in the most deliberate fashion; conceal weapons, such as knives, &c., in their pockets or beneath their clothing; and follow out, as before stated, a series of actions in accordance with the promptings of some leading delusional idea, such as a somnambulist would perform. The case of W. F., detailed below, illustrates this point forcibly, and still more so the one following it (Fork Assiste):

Interparoxysmal State.—We come now to the mental condition of epileptics in general at the periods intervening between their seizures, when the immediate effects of the attack are past, and prior to the disturbance engendered by the approach of a fresh series of fits. In fact, we have to study the peculiar characters of the epileptic neurosis, and the permanent mental reductions which become established, in consequence of the diseased state of the nervous centres and the disordered function. In reviewing a large number of the epileptic inmates of an asylum, it becomes evident that they may roughly be arranged in four classes.

(e) A small section is comprised by those who, upon the subsidence of the seizures, exhibit a perfectly normal state of mind; no essotional or intellectual disturbance can be traced by the strictest accratiny, and their conduct (consistent in every respect) enables them to take up any employment for which they were fitted, and carry on responsible functions in various departments. Why are they, then, innuites of an asylum! Because their epileptic seisures are preceded or followed by each transient arental aberration, or by such reductions as remier them at these tieses a risk to themselves and others; or, because the interval between their attacks is so short and exposes them to such risks in their asnal avocations, that they demand continuous supervision and treatment. Outside an asylum this class is a large one; comprising,

as it does, all those is when the nature of the epileptic science is such as to affect the mental faculties but slightly, if at all, even in the pro-paroxysmal as well as post-paroxysmal stage. It is a well recognised fact, which the student must bear carefully in mind, that certain forms of spilepsy with frequent fits may last for many years, and yet the seemtal faculties remain, in the interval between the successive swinsres, perfectly intact; nor must be be misled by any such notion (as we once heard expressed in a court of justice), that because a sum has hed jits for many years his used must necessarily have suffered persumently; although, of course, in a large number of cases, the presumption is in favour of such implication.

(5) Then there are those cases of epicepsy in which the affective sphere of the mind is almost exclusively at fault; where, with a normal and often vigorous intellect, we still fast, as a permanent residue, an emotional perversion, which maps them off from the healthy community, and which reveals itself by certain oddities, eccentricities of conduct and want of control; i.e., by an abnormal welling-up of feeling, an initiability of emotions highly characteristic of the class. To this section, also, belong many who might be called moral imbeciles.

(r) Then there is the extensive class of those in whom the main feature is intellectual perversion; in whom delusional states are rife; and in whom the passions are violent and uncontrolled; a class which comprises some of the most dangerous elements amidst our asylum communities, since with all the natural impulsiveness of the epileptic, the delusional states engendered render them, at all times, apart from their paraxysmal scirares, prone to acts of desperate violence.

(d) Lastly, there are the advanced cases of epileptic dementia, in which the reductions are so extreme, that the higher emotions and moral sense are well-nigh extinct, and the intellectual operations correspondingly cofeehled; and in whom the mental life of the individual consists of the lower animal instincts and possions, and the supuloes towards their immediate gratification. None of the mone service at a more degraded level than the epileptic dement; none of them exhibit more repulsive traits—more observious passions; and in none does the physique undergo such a corresponding degradation in type.

Amongst the several arbitrary divisions thus enumerated, there are certain mental characteristics common to the whole class which largely outer into what we mean by the "epileptic neurons." Notably prominent is the tendency to self-engrossment which may pertain, not only to the bodily sensations, giving rise to the grosser forms of hypochendrinsis, but also to the passions, and feelings, and sentiments of the individual, which are merbidly dwelt upon and, so, intensided. Any bodily discomfort, however trivial, is thus apt to be

exaggerated into a serious ailment, and incessant complaint is made to the medical attendant as to the state of the storach, the bowels, the heart, &c. The spileptic is essentially a hypochondriac; on the other hand, irritability of temper, to which he is prone, is sure to find as object of complaint; imagined ills are conjured up, and he conceives himself the most injured individual in his ward. In like manner, his sentimenta respecting his own abilities and aptitudes undergo a like intensification, and be becomes vain and self-laudatory. This rise in the self-consciousness begets an egoistic state of mind, which renders the epileptic the most selfish and narrow of all beings, and the corresponding decline of object-consciousness is well illustrated in his utter regardlessness of the time or comfort of others-his incessant and wearying importunity and demands upon the patience of his fellowcreatures, his obtrusive display of self-interested motives-in fact, in the profound decline of the altruistic sentiments and higher moral incentives to action. Opposed to this moral decadence, at first night, might appear the statement that the epileptic often betrays a notable degree of religiosity; above all others of the insane, he is distinguished for his afherence to religious rites and formalities; importunate in his requests to attend religious services, addicted to repeating Scripture texts, to constant person of the Bible and devotional works, to singing sacred hymns, to falling on his known in prayer upon inapt occasions and with an obtracive show of mock piety; he but illustrates another phase of the rise of self-consciousness as it pertains to the religious sentiments. His religious life falls in its intellectual group, it is essentially egoistic, shallow, selfish, and similar to the undeveloped phases of the religious life in a low grade of civilisation. The grouest animal pussions and their gratification part years with this mock display of pirtiatic feevour, with a sanctimonous hearing and a profuse insulgence in religious cant, and with apparent consistency in the epileptic's mind. The realisation of the religious life in action—the objectivising or actualisation which is its peoper sphere—is at fault; there is a decline in object-conscioussess; hence he finds no difficulty in reconciling these feelings with the continuous gratification of low and depraved instincts.

The lower types of splicpties also exhibit a characteristic low curning and deceit; they are treacherous in their dealings with their associates, this rish in their proposition, and when arraigned upon a charge of misconduct, will meet it with the coolest andacity, and lie to the bitter and. The epileptic above a tendency, akin to that of the hysteric subject, to malingering. Both will falsely accuse of violence those with whom they are aggrisved; will treasure up a tooth, or wilfully pull out their hair by the handful, and present it, to counterance their charge; and will countingly call to their decease certain delusional notions to which they may be prone during the period of their science, if they can benefit their position thereby—this tendency should be carefully herne in mind. All the appeared delusional statements of an spileptic are not to be received, except with caution, as their sole object may be to obtain some indulgence or requirement, and especially so with the hypochondriscal subject. Consorting with this moral decadence the epileptic is remembly instinctive and impulsive, a feature demanding the utusest tact in his management at the hands of those who undertake his case; his conduct, when aroused, is possiblinity brutal and ferocious, and often characterised, like his actions during periods of epileptic automatism, by whelly disproportionate and excessive violence.

The reaction-time in epileptic insanity is delayed as will be apparent from the following series, taken indiscriminately from a large number of cases examined —

BEAUTION-THE IN EPICEPTIC INCOME.

		Annel	to Wilmidden.	Option	stieds.		
J. J. M., J. V.,		4	530 od	a second.	-23 et	a second.	
P. E.	a.			(18)	-	-53	
II Di.,	4	-	-	19	-	-21	141
W. P.,		1	-	47	-	351	316
R. H.	-	-		24	-	-30	84
A. D.	-1		-	308	-		111

Medico-legal Relationships. - No form of inmuity so frequently presents staolf to the medico-legal expert as epileptic insanity, and this from two very obvious reasons. Epilepsy is a disease to which the criminal class are poculiarly subject; it is the associate of intemperance, moral degradation, vicious bodily organisation, and the very varied heritage of a criminal parentage; and, in the second place, of all cerebral diseases it is the one which tends to engender impulsive forms of insanity, as well as to degrade and heutaline the victim's nature, whilst the phenomena of post-opileptic antematism often lead to acts of apparent criminality although the subject is really an irresponsible agent. First, then, we would sale : How far does the fact of epilopsy render its subject irrespossible for his actions ! It is obvious from the foregoing considerations that epileptic insatety no more presents a aniform series of symptoms than do the physical accompaniments of the epiloptic paroxysm always assume the same orderly sequence of events. Just as it is allowable to speak of epilepsies, rather than spilepsy, as regards the physical features presented by the attack; so the correlated mental symptoms exhibit very varied forms of insanity. And, apart from the survive

type of the insanity, we also witness a great variation in degree; so that, we may not only find that our patient is prone to melanchelia, mania, delusional insanity, impulsive insanity, dementia, but also that all these anomalies may vary in degree from the slightest to the most intense manifestations, or long periods may intervene wherein no mental anomaly presents itself. It cannot be questioned that many epileptics antier little, if any, mental derangement prior, or anterquent, to their seizures; and, that the interperoxysmal period may be one consistent with the most perfect sanity, with vigorous mental activities, with intellectual espacities of a high order, and with special aptitudes and executive address which enable them to hold positions of trust and high responsibility. It is only as the immediate forermore or outcome of the epileptic scieure that they may be truly irresponsible agents. The "dis" may even be of frequent occurrence, and yet the interval between two consecutive seizures may present no obvious mental derangement. We must not, therefore, assume that because a patient is epiloptic and has many fits, even with mental disturbance, that he is necessarily alienated in the interval between such attacks, and therefore irresponsible for his actions. The longer the interval between two seizures, contris puribes, the greater the presumption also that the mental faculties may escape implication; and since frequent occurrence of £ts is damaging to the mental constitution, especially fits of a certain type, so, conversely, we anticipate more interparoxysmal mental derangement in cases of rapidly-recurring attacks. In fact, the provisely of an act of outrage or violence to an spileptic setrors directly favours the presumption of mental impairment; and, in this connection, it must be strongly insisted upon that the mental disturbance following upon a single opileptic fit is frequently prolonged over many hours or oven days

The question might, therefore, he saturally put: if an act of violence be committed by an epileptic a day or two subsequent to an epileptic seizure, is the agent to be regarded as responsible for his conduct, because on the expiration of a further period he is found perfectly same! Obviously, from what was implied above, we are not justified in assuming that, since he is free from obvious mental decangement a week or so subsequent to his science, he was not allenated for some hours, may, slays, after the attack. Acts of suicidal or homicidal nature may be committed subsequent to epileptic seizures as the outcome of

- (a) Genuine automatism;
- (b) Or as an incontrollable impulse devaid of motive;
- (c) Or during the blind fury of epileptic mania;
- (d) Or, lastly, the art may be instigated by the promptings of a deluded mind.

It is essential that we clearly distinguish these states in investigating the hidden springs of a murderous or suicidal attempt.

First, as regards epileptic automatism, it must be remembered that actions of very considerable complexity may be performed whilst the individual is a more mashine soting like a purely reflex mechanism, the patient upon return of normal consciousness being completely oblivious to the set which he has perpentated; in this condition he is neither constious of the set performed nor of its consequences.

Incontrollable impulse is snother form of morbid activity which reveals itself in the subjects of epilepsy; like the motor explosiveness of the convulsive paroxyam, a leading idea may pessept to action with an imporative demand which brooks no denial. Epiloptics are often conscious of this dire necessity; it may arouse within them the aucient dectrine of fatalism; they may be terrified at their own helplessness, and implore us to impose restraint-a plea the very last to be neglected by the medical advisor. The impulsiveness of the epileptic is proverbial, and should mover be last night of in questions involving his responsibility; for, where other evidence of mental impairment is wasting, where delusion cannot be traced, where the subject was possessed of presumably normal consciousness at the time of his act of violence, still a factor of the gravest moment in this line of conduct may have been a notably diminished self-control. The easence of an impulsive act is, of course, its spassoodic suddenness and want of apparent motive. The lawyer naturally enquires for a motive, which, if found, he regards as oridence presumptive of the politional nature of the not, and subservive of the doctrine of its impulsipe character. He assumes that the presence of motive warrants him in regarding the epileptic as fully conscious of the deed he performs—of its nature and probable insue. We should be most guarded in accepting this conclusion.

The motives prompting to action in healthy mental operation are so complex as often atterly to dely our most careful scrating; much more so will this be the case when dealing, not with an organism which reacts within fairly constant or calculable limitations, but with the perturbed beain of the spileptic, in which the line of conduct is subject to no method of calculation. Even if there be a strong colouring of evidence that the act was the outcome of apparent motive, the natural, and often inborn, impulsiveness of the spileptic neurons should warn us aericasty against arriving at too hasty a conclusion upon this head.

In the third place, outrageous actions may be committed during the wild manin incident to epilepsy; in these cases, of course, no doubt can arise us to the agent's utter irresponsibility. The nature of such acts in these latter cases will often be characterised by their frightful violence; the crime can thus often be instantly identified by its blind, aimless, uncalculating, utterly reckless fary, which at once stemps it as the work of an apileptic (Mondaley). There are in these numberous outrages of epileptic manis indications of—(1) an utter less of control, (2) of deep reductions in consciousness, (3) of violent explosive conduct.

Lastly, the act may be done, as stated above, at the instigation of a deluded mind. The epileptic imans are not necessarily (or even frequently) delusied, and we should look with some suspicion upon cases of affirmed delusion, fostered by those whose paroxysms are infrequent, or occur at long intervals. The delusions of epilepsy arise, as before stated, during the early and permonitory stages of the attack; the paroxysm itself often having the affect of clearing off the mental clouds, and of leaving the subject often better than before the seizure. One crucially important feature, however, to recognise from a medicolegal standpoint is, that the delusions prevailing prior to the epileptic seizure may be operative immediately subsequent to the fit, and before consciousness is completely regained. This has already been noted, but its importance merits emphasis here. When an epileptic suffers notably from delusion prior to his seizures, the outcome of his paroxysm should be carefully watched (W.F.).

It is, of course, of the greatest importance to recognize any connection existing between the conduct of the epologic and the previously existing deliminal state | since, if the art be the direct outcome of, or can be traced up to, such an abservant state of mind, he must, of course, he regarded as an irresponsible agent. The depth of reduction in these entieptic demangements should receive attention.

- (a) Was the act characterized by complete automatism ?
- (b) Or was he sufficiently conscious as to recognise its nature !
- (r) Or was he sufficiently conscious to recognise its crimical nature also—the distinction between right and wrong, and the perhable issue?
- (d) Or, even if the latter was the case, was it the cutcome of instance delusion, or perpetrated as a purely incontrollable impulse?

Malingering.—Epilepsy is, as is well known, frequently frighted by the criminal community: often with the object of exciting commiseration and caterting pecaniary assistance; and this is done with considerable cunning and success by some. But, though the community generally may be imposed upon with case, it is scarcely possible that one well-versed in the subject could be decrived by the most cunning and expert. The intense pallor preceding the strong convulsions, the widely-diluted pupils, the disturbed organic functions, and, often, the minute extravantations of blood over the surface of the body cannot be assumed; and would, therefore, lead to speedy detection of the fraud. It is not so with the forms of mental derangement associated with spilepsy, the defusional perversions of this stage being readily counterfeited, and by no means easy of detection. The plon of epilepsy is one so frequently established in defence of cases of outrage, assault, or mirrier, that the possible frigning of this disease and its forms of mental disturbance should always be borne in mind. The hifficulty is greatly enhanced by the fact that the criminal classes are so much associated with those subject to epilepsy, that they acquire considerable address in frigning the disease; and they have sufficient cusning to assert the presence of hallociastery and delusional states if thereby they can gain their rods.

And here we are face to face with another difficulty: the governe epileptic is also notably curning, and often much given to shamming -not bodily aliments alone, but mental also-usually with the object of obtaining some desired indulgences; it is by no neans infrequent to discover an epileptic girl "shamming" a fit, just as others affirm they suffer exeromating pain, &c. Such a subject, armigned on a trial of murder, would be most likely, if he thought the plea of insunity would save his life, to reproduce his former experiences, and assume definions from which he might have suffered at times. In the case of Rea. v. Taylor, where the prisoner was charged with the nurder of his infant. child and of the police superintendent, it was believed that the statements advanced by the defence as evidence of delusional perversion (obtained just price to his trial) were of this nature. The closest elservation and repeated examination during his early imprisonment wholly failed to elicit a deluded state; and it is strongly suspected that the frequent subsequent examinations which he underwent suggested to his mind the policy of malingering. That he was fully aware of the gravity of his offence, and the probable issue, was usade apparent by his statement to a fellow-prisoner on the night preceding the trial, that he would probably have to go to a lunatic savium, a recognition of his position whelly inconsistent with the assumption of the defending counsel, that the prisoner was a complete mental week. That he was subject to delusions, about the period of his "fits," could not be doubted; and that the murderous act was instigated by such definion is equally free from objection; yet the facts, that a period of some menths had elapsed without such a seigure, and that no clue to delusion was forthcoming until just prior to his trial, were strong evidence in favour of his malingering. In this case also no epileptic seignre had occurred for three months unhoquent to the murder; and the question as to the very existence of epilepay in his case required examining. It was found that his neighbours and fellow-townsmen. knew little or nothing about his "fits," and evidence as to such could only he obtained from interested parties-his wife, parents, and a ledger. But here again, on the other hand, it was obvious how readily a genuine description of spileptic seitures may be recognised. from a felgued account. A most graphic account of grand mal and

petit mal was given by each witness esparabely examined, consistent with each other in every detail, evidence which most distinctly would have broken down if the witnesses had not actually and individually witnessed the seizures. Another question of interest in this case was the actual condition of the prisoner's mind at the time of the act. Was the act characterised by impulsiveness, or was it the octcome of the delusions previously fastered! There is little room for doubt that the act was deliberate and intentional, according to his own account. He had for hours barred himself within his house, handling a loaded gun; his pockets contained several loaded partridges; and it was only after watching his pursuers for some long time through the window of the house that he eventually took deliberate aim "hehind the ear" of the police-superintendent and discharged his gun. He both intended to kill his victim and fully recognised the surrounding circumstances. In short, the act was very elearly not the impulsive not of egileptic furor, but the well-planned and determined not of a deranged wind prompted by delusion. One of the most striking instances of hallucination, or the sura epileptics, becoming the motive for action during the automatic stage is illustrated by a case where the subject (who was unfoubtedly neurotic, of a very had stock, but who was not known to have previously suffered from epilepay), as he lay in bed beside his wife, inragined he saw two burglars rifling the contents of a chest in his room. He sprang out of bed, and, according to his own statement, as he rushed from the room for help, he saw one of the men rush upon his wife and strike at her with a listchet. remembers nothing more; but was found by a policeman (to whom he made the above statement; wandering in the streets, varant and confused, and holding a hatchet in his hand. It appeared, from all the evidence produced in this case, that the poor man had a fit, preceded by the visual aura of the burglars in his room, that the idea of the hatchet prompted him to rush down stairs to the cellar in order to necure that weapon; and during this automatic stage he numbered his wife. No case could more formbly indicate the frightful risk to which the aura may expose certain epileptics during the past-convulsive stage, and the necessity for close aspervision.

Treatment.—No drag has so powerful as influence over the convulsive attacks of chronic spilepsy as the bromide of potassium, or the combinations of beamine with sodium and ammenium. The first-mentioned is most relied upon, and may be administered for very lengthened periods of many months without inducing browsies, and with very marked benefit. There are a certain proportion of the epileptic insure—doubtless the minerity—in whom the bromides are of little or so avail; but by far the larger number calibit a notable reduction in the frequency and severity of their fits upon their administration. The

bromides have no immediate action in checking the day, so that a somewhat prolonged treatment is necessary ere the desired effect is obtained; house, if the attack is threatening (owing to the soverity and rapid succession of the convulsions; to pass into the states spellspricus, it is of little use depending upon the bromide for cutting abort the attack. For this purpose we have no rival to chloral, which, given in sufficiently large doses, rarely falls to arrest the scinures. Where there is an enfeethed heart and torpid circulation, large doses of chloral naturally suggest great risk-hypostasis certainly is to be feared; yet the imminent peril from exhaustion, due to the repeated seignres, renders it necessary to administer this drug, with certain precautions. It is well, first, to inject subcutaneously from all to A of a grain of atropine if a large dose (40 to 60 grs.) of chloral has to be given. Thus shielded a sufficient dose of the drug may be given to completely arrest the attack, a procedure preferable. we think, to the more frequent administration of small dozen. It is imperative in these cases that pourishment be given in the intervals between the fits; and, if the patient be too unconscious or torpid to swallow, it must be introduced by the stomach tube. In a few cases vomiting may occur and food so given be constantly rejected, and yet a nutrient enems may be retained, and, with this chloral may be combined. It should always be borne in mind that chloral has its role in the emergencies of epileptic outbursts, bromide in the more prolonged treatment. Many putients in asylums cannot live without the bromide treatment; if it be neglected, the fits become at once sofrequent that they run imminent risk of passing into the epileptic status, and dying thes. Hence it is that in most asylome we find chronic spileptics who for years together, with short intervals of rest, are taking bromides continuously, who maintain their health well, have hearty appetites, are cheery and industrious, and whose fits, securring at long intervals, would ut once assume a serious character if the drug were suspended.

It has been stated that the percentage of homoglobin and the apecific gravity of the blood occasionally increase after epiloptic soircres, and are constantly higher in those epiloptics who have for years adopted the bremide treatment, than in those who have taken becomides in moderation only.*

Prolonged treatment usually entails in many a very troublesome form of some. It is customary, in such cases, to suspend the drug for a few weeks, and order the patient saline laxatives; but it may equally well be met by the combination of a small dose of the liquer armenically with the bromide salt. In fact, arsenic may be given in all cases alike with decided benefit from the outset. On the other hand, a certain proportion of our spileptic insane have a series of convulsive attacks periodically, often with intervals of months between. During the intervening period they are free from excassion, active, and cheerful subjects, but when once the fits are about to occur they become querulous, hypochosidriscal, and violent. Such patients may often have their attacks cut shore by a dose of chieral, and by removal from sources of irritation to the quiet of a darkened room; nor do they by any means invariably call for prolonged bromide treatment. To select those cases scatable for brounds treatment from those who can be safely kept without this drug, requires a prolonged experience—each case must be judged upon its individual merits; but, in all alike, branide treatment should, in the first place, be adapted with the hope of possibly lessening the frequency and alleviating the severity of the attacks.

In the epileptiform attacks, such as characterise the history of many cases of general paralysis, we shall find that the aromides are of no avail; here chiceal must be our sheet-anchor. The long-continued maniaral excitement of epileptics is less met by repeated doses of the asyluss "green mixture"—i.e., bromide in combination with the fine-ture of Indian hemp; half-drachm doses of the former, with one-drachm of the latter, given twice or thrice daily, rarely fall to alleviate the excitement. In the more serious delirious outburst of spileptic furce, it is well to administer chloral at intervals, followed by the former mixture.

How bramide acts upon the nervous centres we do not know; by what means it induces more stability of the discharging cells is at present a complete mystery. "Bromides are said to cause contraction of the small arteries of the train, but it is exceedingly doubtful whether any part of their influence in epilepsy is due to this action." (Govern).

Iron, given in combination with brounds, is of indubitable value in all each epileptics as exhibit any notable disturbance at the measurant periods, at which time there is often not only a succession of fits, but also much maniscal excitement. Its use is also called for in all the broteroid attacks.

GENERAL PARALYSIS OF THE INSANE.

Contenta.—Fredressata Egram—Early Moral Perversion—Failure of Reverses sentiative States — Kathehlood Attention — Transport Ammenta — Visco tector Derangements—Farily Parents—Second Stages—Delunions of the Paralytic and Manumerine—Varily Parents—Second Stages—Delunions of the Paralytic and Manumerine—Varily and Osconstine Proposition—Second Perversion—Farild Expression—Articulatory Impairments—Corbent Secures—Syncope—Egilepsy (J. F.)—Unlikeral Twitching (J. S.)—Egileptiform Attanks—Conjugate Deviation—Case of H. P.—Aponicciform Secures—Monopleps—Hemiliation—Manufacture Some Discrimination — Apparents for Testing Approximate of Weight—Beaction Time—Spanic and Paralytic Myosis—Mydipian and Ammenias—Bellex and Associative Indeplogua—Statistical Tables—Consensual Marchenius—Bellex Delutation—Significance of certain Popillary Association—Spinal Symptoms — Deep Reflexes—Tabetic Stat — Investigation—Christial Groupings of Geograf Paralysis—The Blood in Geograf Paralysis—Christial Groupings of Geograf Paralysis

It is not an may task for the student to gain a clear and comprehensive view of so protean a unalody as that of general paralysis of the insune; not need he be surprised or discouraged at this when he is informed that most authorities on the subject differ as to supposed excitetion of the disease—whilst others are sceptical as to whether the term does not comprise several rather than one pathological entity.

General paralysis, even as a specific entity, has been called in question, and its severance from other forms of chronic certical encephalitis has been regarded as an arbitrary and unjustifiable procedure. By fair the most able attack upon the morbid unity of this disease has emanated from Dr. Reginald Farrar, and, although, we are not in accord with the general thesis, we fully appreciate the vigour of thought and breadth of view which characteries Dr. Farrar's article.*

When he is further told that no single portion of the entire cerebrospinal system and its peripheral nerves (not even the sympathetic
system itself) is safe from the encroschments of this far-reaching
disease, he will be prepared to meet with a most complex symptomatology, and one in which varied groupings of symptoms may presentthemselves as one or other region of the nervous centres is implicated.
Although the whole cerebro-spinal axis may become involved in this
disease, it yet undoubtedly expends its chief force upon the cerebral
correx, which is primarily the affected site; yet, cerebral, bulbar, or
spinal symptoms may one or the other preponderate, or be so variously
grouped and associated, that several artificial subdivisions of general
paralysis have been framed by different French writers of eminence,
the utility of which, however, is questionable, except as a matter of
pure convenience for purposes of description; they do not represent
genuine pathological varieties. What the student should more

""On the Clinical and Pathological Relations of General Paralysis of the Interior," by Regensid Farrar, M.A., M.D., Onco., Journ. Mescal Sc., 1935.

especially bear in mind is the fact that, in this affection, he is dealing with a coarse beain disease, which, implicating primarily the highest nervous arrangements, is prone to spread progressively, both laterally and in depth; a disease which ultimately leads in all cases to dissolution of such nervous mechanism, and to correlated mental reductions. It must be admitted, however, that this progressive deterioration of the nervous mechanism from higher to lower, from lower to lowest levels, is regarded by some able observers as not a satisfactory statement of the case. Whilst roubily admitting that the chief. incidence of the merbid factor is on the cortical nervous system, some observers bold that the advanced, early, and extensive peripheral changes (nerve and neucle) so often found, and now universally admitted, bespeak something more than a mere secondary implication (secondary, i.e., to the primary brain lesions) and that they closely approximate (if they are not identical) to the conditions found in the group of primary toxecnic Neuroses, dependent on an intrinsic toxis agent (A. Camobell). The progressive impairment of highly elaborated motor mechanisms and the mental reductions recogrise the characteristic features of this disease, however diversified in type. Moreover, his anatomico physiological studies of the brain will have enught him that in a disease spreading over the sensors and motor areas of the cortex (involving so universally the substruct of the mental operations) the mode of onset, the signs and symptoms, the progress and duration. will vary greatly with the regions first implicated.

Prodromal Stage.—The predromal stage of general paralysis is of very variable duration; it is usually prolonged over many months, and often embraces a period of several years. Many of the symptoms then apparent are trivial, taken by themselves; but several are of the gravest import and highly significant, especially when the ensemble is considered. A restless, unwosted activity (mental and physical) is of frequent occurrence, a feeling of superabundant energy prevails, for which there appears no adequate relief; often there is under tritiability and a perversences which will not brook control or contradiction—as surreasonable demand upon the time and indulgence of others; way wurdness, fickleness, or outbursts of furious passion upon trivial protexts in those who had previously been more self-controlled and anisable; a growing change in the disposition and character, usually signalized by perversion of some one or more of the moral sentiments—a fact of primary import from a medico-legal point of view.

The implication of the affective sphere of mind may issue in melancholic gloom or despondency; or, on the other hand, in undue clation and bics-fire; but just as often in audien alternations of mood from one extreme to the other. The general restleaness spoken of pertains

^{*&}quot;Neuro-procedur Changes in General Paralysis," Joseph Montal St., April, 1994.

particularly to the codinary purvaits of life and business; there is under eagement, a planning, scheming spirit, often exhibited in extravagant investments or in extraordinary sullay incommensurate with the autiject's resources. Or it may show itself as intense anxiety about his prospects, his home and family. This frequently passes into more marked clation, as eguism which displays an exalted view of his own attainments in arience, in art, or in general intellectual capacity; an officions self-gratulation; a tendency to extravagant talk, to implation of his own status, his wife and family, and a yearning to test his intellectual or physical vigour. The religious sentiment is often in the ascendency, and may lead to various philanthropic schemes; and new projects may be based upon similar exaltation of the domestic or social feelings. Emotional waves are of frequent occurrence; and willy, uncontrollable laughter may replace passionate weeping, for which no adequate cause can be assigned. It will be observed that we do not infer from all this a distinctly defeated state of mind-the existence of defunious becomes a more prominent feature in the subsequent stage-although at this period the patient hovers on the borderland of delusional percercion. The judgment is enfectled and clouded (not necessarily perverted), and the condition is, in fact, one of overbalance. As before remarked, moral perversion is what appears esfrequently to present itself at this period of incubation; moral lanses are so frequent at this time that the unfortunate subject, especially if he belong to the lower strata of society, becomes lodged in prison and detained for offences committed during this early period of aliceation. It is a most common experience in public anylums to receive from prison authorities subjects of this disease, who have been arrested for theft, drunkenness, violence, or indecent assault. The moral lances to which we now refer differ smentially form the acts of those suffering from so-called moral invanity. In the latter, the actions indicate impulsive and uncontrollable states, as the result of a lowered or defective moral sense; the normal inhibitory central is wanting and instinctive impulses rise into full activity. It is not so with the acts of the general paralytic; they are neither presseditated nor impulsive, but casual, often appearing to be unconsciously performed; even if the act appear determinate, its nature and consequences are wholly obscure to the agent's mind.

And here the essential nature of these acts on the part of such subjects becomes apparent; that high degree of representativeness essential for the recall of similar actions previously performed, and the virid realisation of the consequences of such actions in the past, is here solvely assuting; and still less is that re-representative faculty intact, which enables him to contrast the act as viewed in its nature with pertain ethical canons. The moral lapse is, therefore, truly significant of a clouded intellect, of an incipient dementin-the cognitive, relational, or intellectual element of mind is on the wane, That such acts are not merely the result of simple perversions of the moral feeling is sufficiently attested to, by the complete absence of forethought and indgment which characterises them, by the absence of choice of communicances favouring the act, by the want of object or reasonable metive—as when a wealthy man purious an article of trivial value, as well as by the silly character of the act and manner of its accomplishment. An act of theft may be committed with open effrontery, so attempt at concealment being made; the most wanton putrage on public decency—the most audacious libertinism—may be committed by an individual apparently quite oblivious to a breach of public morals. Thus, a respectable member of society, of good social standing, gifted with many amable virtues and natural talents. suddenly develops an unusual and objectionable freedom of speech and action, shocks his wife and family by various irregularities; plays the "bero to the barmaid;" indulges in unwouted aleshalic excesses; makes extravagant purchases or stilly presents to opcordon friends and causal acquaintances, for whom he suddenly professes a sincere attachment. In one such case, observed by the writer, extreme emotional instability prevailed, violent passion would ensue upon the most trivial occurrence, and just as readily might the patient be calmed into good humour, or made to shed tears profusely. Another patient, watched through this stage of the disease, conceived exalted notions respecting his family ; his eldest daughter became a constant theme of converse, on which he would fondly dwell until he had utterly wearied his hearers. He then developed a too amin'tle weakness for the other sex, and from being a model husband, became careless, suddenly left his home, and was not heard of for some weeks. It then appeared he had developed a crare for presching, and had travelled as an itinerant preacher amongst the mining community of South Wales. He returned to his friends deeply impressed with the importance of hismission; talked incessantly upon religious topics; and became murbilly deprensed and hypothendrises). In a case of incipient general paralysis, the subject of which was a highly talented mathematician, one of the earliest psychical symptoms was intense despondency, together with sudden lapse of attention and memory. Often when absorbed in the interest of solving a problem have we seen him cover his face with his hands; rise from his clair; and with a pained expression and the burried remark, "It's of no use-it's all gone," burriedly leave the room. He frequently confessed how painful such a state was to him; here utterly incorable he felt of exercising the alightest effort of attention; and how completely oblivious he became to the various links of the argument followed, before this disruption occurred. In this

instance these audden amnesic attacks prevailed for many menths before definite aberration was recognised, and the onset of the established disease was one of suiden minimal excitement, accompanied by acute hallocinations. This subject also spoke to his medical friends of the suiden and causeless emotional states—"as a welling up of his feelings, only relieved by a passionate flood of tears."

The transitory amnesic states are very frequent as an early symptom of the disease, and almost invariably imply a serious failure in attention—the faculty which, as Sir J. Crichton-Browne has insisted, is certier impaired than any other. To the same origin must be attributed the forperfutures which is an invariable accompanisment of this early stage, and which so often leads to inconsistent, ludicross conduct; inattention to the claims of others; and unconscious infringement of codes of honour, or of constast.

"This loss of memory will be observable in many ways; especially is he likely to deget what he has some a day or two previously; and he will not only be largestful, he will be careious, apathetic, and indifferent about that which formerly interested him; and, when he takes up new otherses and projects, his attention non-flags, and his interest variables. We see, in short, in his whole manner of life a weakening of mind, such as may be noticed in the commencement of small demonstra; but which, occurring in a fine and vigorous man of, it may be, thirtlyline, his eartly infinates the rain over now commencing "(Birmijlers)."

We observe, at this period, that a very impressionable state of the vaso-motor system often prevails; pulpitation with alternating flushing and pallor of the face, or, often, severe headashe and rewalgic pains are complained of; the simulation is generally singgish; and an early symptom (one for which the patient often first comes under notice) is that of a torquid liver. The hepatic functions are almost invariably deranged, leading to obstinate constipation, building, and digestive troubles; the skin often assumes an interior singe; such symptoms affording material for hypochondriscal complaints; numbers of the hands, with tingling and fermination of the skin, are also not infrequently complained of. Another frequent premonition is that of vertiginum attacks; alight attacks of vertigo often escape notice, the putient not complaining unless his attention is directed to the matter; they occasionally, however, become severe.

Even at this early date there may appear distinct motor troubles, a fine fibrillary quivering of the tongue may be observed, or a courser twitching of individual fibres; an inco-ordinate jerky protrusion of the organ; a tremulaumens of the upper lip or the facial muscles during convernation. Pupillary anomalies may co-exist also, or may antedate the above paretic symptoms by months or even years, as athroned by Grieninger. Another highly aguificant group of symptoms is constituted by certain epileptiform or apoplectiform sciences which may now erams, and which may become frequent at a later stage of the disease. They may under in the fully-established affection, and thus may form, so to speak, a definite line of demarcation between the earlier and the second stage; but it is just as frequent to hear of such accuracy, both convulsive and apoplectiform, far back in the history of the case.

Second Stage. - After this stage of alienation has prevailed, for a longer or shorter period, more active symptoms are liable to arise; it may be by a granfool transition; but, often, there is an obrays passage into a maniscal condition in which vivid hallscinations pee-The intensity of the excitement is often extreme, acute maniacel states (verging even upon delirious mania) are frequent; incessant restlesaness, obstinute sleeplesaness, noisy baisterous excitement, and blind uncalculating violence, especially characterise such states. The reductions are so great that the subject wholly fails to appreciate the meaning of the simplest assistance rendered him; he struggles violently, and resists attempts to does or undress him, or to give him the necessary food. His violence is often so great as to expose him to the most serious risk of fractured bones, even from the best-directed afforts to nurse and nourish him; such cases are a source of the greatest anxiety in our asylums. The blind fury of these states remind us of similar states of excitement in the epileptic; and, as a fact, are frequently a sequence of epdeptiform secures or of attacks simulating post sud. In the less acute maniscal attacks the characteristic delusional state of mind reveals inself. With beaming face and muscles, tremulous from emotion, he endeavours to fix the glorious but transient visions which float before his mind's eye; in rambling incoherent utterances he insists upon his wealth, his exalted station or future destiny.

It will repay us to study a little more closely the nature of this expansive delirium. In the first place, the delinional state is the antithesis of the so-called monoscopical delinion, which is essentially fixed in character, and is in itself a direct perversion of the individual's intellectual life. The grandhose conceptions of the general paralytic are wholly different in their nature, and are the direct outcome of an unrestrained imaginative faculty, no longer subject to the coordin of the reason. Those standards of objective reality which a life-long experience and knowledge may have established no longer exist for hits, or are clouded by the mental storm; and the only criteria of truth perceived are the subjective impressions around by the morbid excitation of his imaginative sphere of life; there is no reason why he should doubt their reality, as no challenge can be given by the overcooxided reason, and so the senseous procession of impressions pass

by in everchanging kalesdoscopic huse, uniting and re-uniting in fentastic combinations, conjuring up visions of immortal life, of love, of beauty, of wealth, or of honour, or of all that mortal could desire. Challenge him upon the absurdity of his statements and a secondary irritation may occur; but he readily wanders off into his grandiene strain, asserting and re-asserting with stronger emphasis still more extravagant delusions.

It is in these states that the enfeeblement of attention is precontently noticeable; faulty it was in the corfer stage, as we saw in the coulting amountie lapses and numeric states; but, its failure now is a far more serious matter. The contrasting faculty of the mind, whereby a rational judgment can be formed, must decline with this enfeebled attention, since it depends for its existence upon the vigour of the latter. This failure of attention can be occationally elicited in a remarkable manner as regards certain special mental operations. It is readily observed upon testing this faculty that it occasionally fails more with certain mental operations than with others-naturally with those less habitual to the subject-and, if we continue to test the patient in this direction, the strain becomes at times intolerable, and has a strange result. Thus in a patient, who was parrulous and optimistic, talking incessantly upon the entirect of his "coursers and blood-horses," it was detected that he could not direct his attention to simple numerical calculations without such painful effort; upon one occasion, therefore, when his attention was forcibly directed towards a simple sum of addition, after giving a wrong answer once or twice, the effort resulted in a sudden /but transient) loss of consciousness, a twitching of the facial muscles and right hand, and an aphasic state lasting some five minutes after regaining consciousness. The following day a similar test was applied to this patient solth adeasion' excelle, except that the convulsive disstarge was spread over a witter range.

We have recorded a namewhat similar case where the potient, who was suffering from progressive paralysis, could not protrude his tangue without inducing violent left facial spanus, the tonic twitchings being associated with much vaso-motor paresis.*

Beyond the fact that the delusions of the general paralytic are an transient and variable, there is their simple, connectes, and fragmentary nature to be noted; they bear no logical connection the one to the other, and are therefore most incongrueus and self-contradictory. Then, again, such delusions are simple osserfices, the general paralytic does not reases out his delusive concepts, or attempt to erect a system of belief thereupon; he simply asserts, re-asserts, and never attempts

^{* &}quot;Octable Symptoms of General Paralysis," Belt, Med. Joseph, April and May, 1896.

a proof. Herein again we see the distinction between his deliations and those of the monomeniae. In normal states the imaginative family, however active, if duly controlled by reason, may find its expression in poetic imagery or on the painter's canvas; but in the case of general paralysis, emancipated from such guidance, its vagaries become so astornding that they defy expression. We all know how the very indefiniteness of emotional states renders their expression by language difficult, and at times impossible; and how, in contrast with the feelings, the subjects of exact knowledge find a ready medium for their expression and elucidation in the faculty of speech. The mental life of the general paralytic at this stage is so far made up of sensous feelings and their residual emotions, that he wholly fails to his own entisfaction, to express by language what rises before his mind, his feeling and mental imagery are illimitable, and submit not to the definition of words. Thus, in each repeated atterance, he tries to rival his former extravagance; he has not simply millions, but "thousands of millions of millions of millions."

The nature of our patient's occupation, and the subjects which have chiefly engroused his mind, will usually afford material for these delirious conceptions; thus, a poor labourer who through years of anxious toll has struggled to support a large family believes that he has accomplated exoneous wealth-"is heir to extensive domains, and his children princes of royal blood;" another, a schoolmaster, talks on schools of aniversal education. One who had squandered his means upon the turf was the imagined possessor of twenty hunters which he had just rold for £350 each , another, a poor carter, is possessed of a resgnificent team of horses, each of which he calls by name, and excitedly muscks an imaginary whip, as he drives them on in mad career. One who had occapied a fereign diplomatic post had conceived extraordinary achemes for developing the industrial and mercantile resources of all the European nationalities. Some are agitated by east philantheopic schemes; one of our patients was going to empty all the persons. mylums, and workhouses in England, and start each individual afresh in life "upon a sovereign each;" another intended paying off the National debt. The exuberant welling-up of feeling transforms the status and surroundings of the subject without affecting his real identity; he still retains his name, but is now a duke, a king, or emperor; his wife and children still are his, but are exalted into corresponding dignition; whilst the asylum is a gorgeous palace, the aurous or attendants transformed into princes or courtiers.

Pantastic decoration is much indulged in, especially by the female paralytic; scraps of coloured stuffs, ribbons, and coloured paper are stitched on to their clothing as insignia of distinction, or as an addition to the attractiveness of the subject. The sexual characteristics are prominently developed; the female, especially, betraying much personal vanity or much self-consciousness in the presence of the opposite sex; she is often engaged on matrimonial alliance; connubial subjects occupy the chief these of her delisions; and, occasionally, a well-marked crotic state prevails. On the other hand, the male paralytic raves upon wealth, property, social position, penfestional attainments, manual dexterity, artistic ability, muscular power, and endurance. The variety and transient nature of these delations, their atter silliness, impossibility, and inconsistencies, inmeate a serious degree of dementia in which an enfective attention and an unbounded license of the imaginative faculties counst. The associated excitement may at times be in absyance, to be called up readily upon the alightest reference to optimistic or grandious subjects, when the stolid, half-vacant expression lightens up into a look of fabuous rapture as he pours out his delirious notions. Even in the calmest moments an undercurrent of excitement usually exists, especially manifested in restless, purposeless movements and misdirected energy, with necturnal exacerbations, during which he is notey, destructive of clothing and hedding, and dirty in his habits.

It is at this stage of our enquiry that two groups of physical signs become prominent features; present as they may be in the earliest stage of the disease, they are, however, almost invariably found at this period. They consist in certain articulatory troubles and coulemotor paralysis. Grandines delusions with maximal outbursts, a delire ambitieux, are by no means an unusual feature in some other forms of insmitr; but when to this deliring there is superadded a tresultures of the lips, an inco-ordinate static state of the tongae, and certain popillary anomalies, the diagnosis of general paralysis is next to conclusive. The facial expression of the general pacalytic is characteristic; when unmoved by emotional excitation there is great stolidity, with a somewhat vacant demented aspect, but when roused into conversation the face beams with emotional excitement, the lips and farial muscles become tremplous, and twitchings of the sinsoles of the brow are noticeable. The tremulousness of the lips is well compared by Dr. Bucknill to the like tremulousness in a person about to burst into a flood of tears. An uneasy fixing of the lips is noticed in some, and a tendency to place the hand over the mouth whilst speaking, in full consciousness of the failure. When the tongue is protruded, it is with ataxic jerks or irregular incoordinate movements; and a fine fibrillar tremor will be perceptible whilst it is extended. In advanced cases the tongue will be protruded only with great effort, the mouth being widely spened, the eyes staring, and the whole head trembling and unitendy with the effort expended. The articulation is now distinctly impaired.

Articulatory Troubles.-The character of the articulation is distinctive; it is slowed, hesitating, blurred, approaching that of a dranken man; its utterance is broken, syllable recurrences are interpolated, and the difficult enunciation may end in an explosive effort. In the early stages of the disease, however, a slow, laboured enunciation, with slight blurring of comonantal sounds, may be all that is recognisable; but, upon excited converse, so when rallied on the subject of his delusions, the impairment may be at once canggerated and accompanied by the characteristic trensor of the upper lip. It is the labins and lingual atterance which suffers chiefly; and, if present, it is at once manifested by requesting him to repeat any alliterative doggerel; to repeat distinctly such words as hippopotamus or perambulator. The paralysis of lips and tongue advances in later stages to a more profound degree, and attempts at speech issue in an inarticulate muttering of broken unintelligible Jargon, in which here and there some word is recognised."

"Cerebral Seizures,"—During this stage, or later still, the patient may be subject to convulsive, apoplectic, or paralytic seizures, and very few indeed pass through the descending series of dissolutions of general paralysis without suffering from one or more of these accompanionents. Such "seigures" are—

Syncopal or quasi-syncopal attacks. Epileptiform discharges.

Petit mal, or, exceptionally, grand. Apoplemiform (or true origentive)

med. attacks.

Limited (or unilateral) twitching. Hemiplegie and monoplegie.

Syncopal Attacks.—These are by no means infrequent during the progress of general paralysis, and are often the first warnings given of a failing heart, and of the necessity for keeping the patient in bed. Thus a patient taking his customary neal will enddealy turn pale and fall forwards; his pupils are dilated, his pulse insperceptible, and the skin cold and damp; no convulsive twitching occurs, and after a momentary prostration, he railies and recovers his former state. Such patients demand rest in bed. Attacks of petit safare occusionally mistakes for syncopal attacks, and reported as alight "faints" by the sures or friends.?

Epileptic Seizures.—These are of frequent occurrence, yet by no means so frequent as the epileptiform and limited convulsive attacks. They also occur in early stages of the disease, and are usually referred to by the friends of the patient as slight faints. Attacks of the nature of petit see' are the more usual. They are characterized by very

^{*} New "Hemistrophy of Tongue, with Numerous Chees," by Transiyan, Brain, vol. 464., p. 102.

[#] See "Warnings of General Paralysis of the Innae," by George H. Sarage, M.D., Brit. Not. Journ., April 5, 1990.

transient loss of consciousness preceded by pallor, wide dilatation of pupils, and perlups a slight twitching of one side of the mouth, followed by much confusion of thought, obvious in inconsistent speech and conduct; or by more prolonged automatic states.

J. P., March 21, 1881, second this morning with convaluence, which occur every ten or fifteen minutes, and are identical with spalagaic sciences, except that the convoluence are cheefly unilsteral, involve the cheef muscles but alightly, there being also no livelity of face are electrosted breathing; each attack lasts for there accounts or thereabouts.

The convolute phenomena in their sequent stages were as follows:-

- No patter, but fload and eyes deviate to the right; there is a bestern tauxiculate ery; the pupils dilate widely; the term is raised by the occupits-frontally.
- 2. The mouth is drawn to the right, but switch strongly and mooves the
- A Hight arm flenci, with furninger extended; then raised and convulsively, jerked at absolder; the brew twitches violently.
- 4. In certain assumes the discharge aponds to the right leg also, but did not involve the left.

After the fit there was paralytic decision of head and eyes to the left and notable helplassness of the right arm; the left pupil was much larger than the right, but slowly regained its former size; there were champing measurement of the jaw; no enggenetion of patella-celles; as ankle-closus; at the onset of each attack the heart, previously heating strongly, became improveptible thering the local stage. The cry always precedes such attack.

On the other hand, the occurrence of general paralysis as a sequence to ordinary epileptic insanity in very race, a fact which has also been indicated by Savage, who states :... "It is remarkable that the epileptic insane provide very few cases of general paralysis, but that general paralysis follows epileptiform fits in many cases. So much is this my experience, that when I hear of the onset of fits of the epileptic type in a middle-aged man, I as once look for other signs of degeneration."

Limited or Unilateral Twitching.—Sodden, shythmic twitching of the studies about the mouth, or of the specialised groups of the hand, or of the foredager and thumb of one side are very frequent, either alone or in combination; or convulsive twitching of the dexors of the wrist or close may also be associated therewith. The various numeless of the thigh or leg may be observed picked out by the convulsive discharge, or the whole arm or leg jarked spannodically. Such twitching is often increased by handling and passive suvement of the limb. The limb may be fixed in rigid extension, whilst the toes or fingers are fixed by closic movements. The numeular twitching may be very general, involving both sides of the body (although unequally); and its duration may be protracted over days or even weeks without interruption. The following case illustrates this fact:—

J. S., a general paralytic, was sensed with convolute twitchings of the larte on the 25th of Nevember, 1886. His face was flushed and the skin correct with a groupy unchoose sweat. Both arms, but especially the left are combinedly and commissionally perked by the convolute twitching of the extensor group for the slice and wrist, the flagers of the left hand are sublenly special as in the art of playing the planeforte; the toos also show a tendency to "spread," the feet being rigidly extended, whilst there is almost continuous closes of both galder, expensity interpaced by fleaten of the feet; if, during a period of partial countries of this close state, the side is irritated by a pin, closes is again brinkly established. There is a notable degree of the "paradoxical contraction." The superficial abdominal referces are failed. Tools construct as rapidly produced, and is typid over all parts of the body. Both conjunction are trajected; both pupils show applying an attack bett in larger, and both are fixed to a bright beam of light. However, and thisline paralyses!. Pettern is greatly descented and quite note.

The following day the furtishing was limited to the left foot and hand y the same expansive movements of the digits commun.

Normber 20, 1990.—The corrubius twitching of the left hard and bob recents undergod; the plantar refer is greatly congressed and hyper constitutions (by 187.—The movements above described have continued up to this data county five months; either interruption, but are one gradually declining.

The above was, of course, an instance of such convulsive movements in an advanced stage; but similar secures may occur at a very early period of the disease. The convulsive twitching is usually associated with a certain degree of reduction in consciousness; and, when the discharge involves the right side of the face and hand, aphasic states may prevail, and a certain degree of word-blindness or deafness presents itself.

Epileptiform Seizures, —Under this term are comprised general convolutes neitures, or convolute discharges from motor centres, representing large associated groups of the muculature of the budy and limbs. Such attacks are often unbered in by premonitory twitchings, such as those just described; they are not, as a rule, accompanied by complete ions of consciousness. The convolution or space may start, as indicated by Mickle, "from some point as it were, becoming widely apread and severe, then ebbs away and ceases everywhere except at the starting point, usually the munth, eye, or hand, where occasional jerks are seen which may gradually die out; or, on the contrary, the preceding cycle of events may be repeated, or the renewed convolution may shirely affect the other side."

The onset of the attack is almost invariably benispheric—i.e., the convulsions begin unilaterally, and may or may not sprend to the opposite side; they are often preceded by a well-marked tonic stage as the rapid primary discharges occur; the clonic stage being often long protracted, becoming more and more broken-up into intervals of comparative rest until at last an occasional convulsive jerk of the limb or separate muscular contractions alone prevail.

^{*} Frenche on Observal Phrompile p. 1903.

Another form occasionally met with is that of an associated some most of the head and area; the head and eyes turn as if looking over the shoulder, the pupils dilate widely, and the arm of this side is simultaneously raised in the same direction with the forefinger extended, and a passful cry escapes the patient. This movement may be repeated over and over again for hours in succession. It is important to recognise this form as occasional in general paralysis since it has been affirmed that the cry is a distinctive feature, thus— "Patients in the fits of general paralysis seldom hits the tongue, the convalisions are not se violent, there is not the sura, see the cry, and the mental symptoms will of course be quite different." (Plandford)

These convalues attacks will be followed by the usual results observed after severe discharges from cortical grey matter. There will be partial, or more or less complete, paralysis of the nuncles involved; the facual results may be involved, the cheek flattened, and the mouth draws to the opposite side; there may be more or less glossoplegta, or the patient may be completely aphasic with right brachial monoplegia; or the leg only may be temporarily paralysed, or kemiplegia may prevail. Conjugate deviation of the head and eyes is also frequent as a post-convulsive sign.

Epileptiform seizures may occur at an early period of the disease, anually not until twelve months have elapsed. According to Dr. Newcombe, out of 100 general paralytics, 31 patients suffered from spileptiform seizures, and of these 51, as many as 19 did not develop such symptoms until between twelve to twenty-four months after the commencement of the disease, whilst one only had convulsions within three months of the enset.

The immediate result of these general, wide-spread, epileptiform convalsions is of far greater import as affecting the mental aspect of our patient. They usber in the gravest reductions, often leaving the subject a complete mental wreck. Take for instance the case of

H. P., who are in the second stage of general paralysis, was mildly control, and the subject of entravagant, grandines sections, yet retaining a face amount of mental energy sufficient to enable him to read, write, or to converse in a connected strain of thought, so long as his deletional likes were not entreached upon. He was enabledly seized with applications convolutes, commercing on the left sole of the body, but usually appearing to the appoints side; such asimase securing avoral times in the course of the day and night, and lasting for several days together. On their countries he was left in a condition of probound turbuslity, from which he arror raffied. In his case, persistent and explain watery afrine exacutions accompanied the convulsive acticely.

The mental deterioration following epileptiform seignres is often so

^{*} Op. col., p. 1988 (Italica mon in prightal).

⁺ Sec - Epileptidean semires in general paralysis of the insure," West Middley Asylvan Expects, vol. v.

notable as to sharply demorate the stage of maniaral excitement and delusional perversion from the last stage of hopeless demouth and motor helplosusees.

The spileptiform seizure is also ominous of rapid heesk-down; "in twenty-four out of sixty cases, death occurred within a mouth after an attack" (Neurosofe)."

Apoplectiform Selzures.—The patient may be struck down suddenly by symptoms of an apoplectic type, associated occasionally, but by no means accessarily, with alight convulsive discharge. He becomes helpless in his limbs, heavy, lethergic, and stepist, and this state may deepen into complete come. The face is deeply flushed, the head hot, and the body generally bedeved with perspiration, the breathing may be heavy and laboured, the pulse rapid, and the temperature quickly rises to 103° se higher. The condition is always a critical one, there being bypostatic engagement of the lungs and pneumonia threatening the patient's life; if this is not fatal, it is always followed by serious results—viz., byvarious motor paralyses, the advance of dysphagic symptoms, and by much increased mental enfechiement.

Monoplegiae and Hemiplegiae.—Paralysis socidently occurring without apoplectic or epileptic premonitions involving one or both limbs, or complete hemiplegia, of very transient discover. The satisfactors feature frequently occurring in the course of this discover. The satisfactors of onset is notable; the hand drops whilst at work atterly helpions, or the patient suddenly stambles whilst walking, and is found paralysed in our leg; the deep reflexes will be exaggerated and ankle-closes provail. Patients will thus be found after a quiet night's rest suffering from a graral or a brachial monoplegia which may have completely disappeared in a few hours or days.

Muscular Sense Discrimination.—The localisation of the sense of amoutar discrimination in the so-called "motor arm" of the cerebral certex—the "kinasthetic centres" of Bastian—appears lately to have received considerable confirmation from the clinical and the pathological side. We shall not attempt here to do more than to indicate that in general paralysis where the kinasthetic centres are early, and in the majority of cases most seriously, involved, the muscular sense is obviously defective, and the deticate appreciation by this channel often very seriously blasted. We are not aware that this question has been definitely scattled prior to this date, and we, therefore, bring forward our results as suggesting (1) the localisation of this sense, and (2) the means of accurately determining the defect in this sense by measurement.

In the following cases of progressive paralysis of the issane, the suscular discrimination was tested in eight and left hands, with the

most careful precautions to exclude all fallacies, and all instances were omitted where dementia was so advanced as to introduce a chance of error. The instrument used was Galton's, a description of which is given on p. 301. The figures in the tables indicate the respective indices of the finest series successfully arranged: thus 6—6 indicates that series 6, and all the coarser series up to 12, were successfully dealt with, but that at series 5 the operator failed, and, therefore, series 6 represents the measurement of his bluntness of muscular sense appreciation.

MERSCHEMENTS OF MUNICIPAL SERVE APPROCRATES IN G.P. LOWEST PROPERTY.

	Elgitt.	Left.	Right.	Left
E.C	. 3	7	J. S 8	*
C. A. (Alrediolis excess),	. 3	3	d. V. B.,	8
2. C. (alsoholis exess)	- 3	- 2	J. HC. 8	dn
W. G. H.,		19	W.G	23.
T. B		0	E. B. (alcoholic exercis) 8	18
J. H.,		- 6	EAA.	107
8. Hat			E.A.A	8
J.W.H. (extremely grand)		-8	E. H. (alcoholic excess), 8	*
S. HY uthoholis atomic,		8	T. V.	1.34
W. B.,			W.B.,	3
E.K		6	C. S. R	
T.C			C; S; R.,	12
C. W. Isloubatta enteres :			R. H. (alrehelic emerc) op-	-
Jernoe of January		*	phills; margal and loco-	
R. Day		7	motor atorio); VA	10
W. B.			S. M. (alrestedie mirem), - 12	
W.H		7	J. H	
W. B.	112	10.		
J. K. Junch hypodicustria			W. & poplation , 12 come	46.50
8. W.,			T. M 12	
T. L. N.,			W. St., 12 Justs	
			40	

How far this failure of the appreciation of weight could be sinsevered from loss of tectual and other sense anomalies, was put to the test in several cases, with the results indicated in the following table. In most of these we perceive that little or no impairment of cutaneous sensibility existed, but, on the other hand, an acute tactual sense, and a fine discrimination for temperature and painful impressions. The discrimination between slight differences in temperature was tested by tubes held in the palm of the hand, into which cold or warm water was gradually powed to obtain the delicate shades of warmth required. Tactile sensibility was tested by the ordinary authenometer; the results with the latter instrument sufficiently attest to the absence of dementia as an element explanatory of the muscular sense measurements. For comparison with the table of reconstruents of the factual sense we give the accural results as stated by the best authorities.

⁽e) Back of hand; Il 6 -

Cases of Seneral Paralgain	Mountar feme Discrimination	Torinal Descriptions	Sinon of Temperature.	Benstin
W. R*.	Bigin, Set.	Dight Lem (e) 2.5 mm 5 mm (f) 125 75 (f) 7.5 10 (f) 925 125 (g) 90 125	Right, Lett. Empiritiely loom,	Excited and very grandless.
LK.	7 7	(a) 5 5 (b) 9 9 (c) 22 5 10 (d) 27 5 22 5	Dis.	Depressed and hypochandria- tal.
8. Mt.,	7 9	(b) 25 25 (c) 25 5 (c) 65 5 (d) (15 225	Doc	Advanced G. P. with extreme tremone of face and limbs
K.B.,	* "	10 25 25 16 17 17 17 17 17 17 17	.De.	G. P.—Alcoho- lle scossa.
8.95,	5 5	(4) 25 25 (6) 15 5 (6) 16 5 (6) 124 125 (6) 15 225	Dec	G. P.—Alcoho- lic earons.
表班。	12 5	10) 25 . 45 . 10) 5 . 20 . 10) 15 . 10 . 10) 10 . 125 .	Thu,	G. P., with ex- trome hypo- thombrism.
W.G.H.	+ 19	(a) 25 25 (b) 10 3 (c) 125 125 (d) 125 75	Du.	
CAR.	9 9	(4) 25 25 (4) 16 10 (4) 15 18 (6) 105 19	Do.	
B. IX.		(A) 25 25 (A) 16 25 (A) 15 175 (A) 175 175	Do	
C. A.	\$ 3	(a) 25 25 (b) 15 15 (c) 15 125	Tio.	6, P., with his- ticy of alcoho- lic curson.
T. M.,	feli 12 mosk viš 9	00 40 1 40 1 00 40 1 40 1	Do.	Entremo transce of both hands.

[&]quot;The above figures for tactual decrimination express in Meliosciere the minimum distance of which two points of the compact are distinguishable.

These results clearly imply for all the cases of general paralysis examined, a keen sense of slight differences of temperature; but slight or no impairment of tactile sensibility, with indeed much exaltation of the latter at certain sites-e.g., at the back of the hand; and, on the other hand, distinct impairment of muscular discrimination.

It is, therefore, interesting to note that in certain other cases of insanity a similar fallure prevails, and where we have every reason to believe similar regions of the cortex are involved. We refer to cases of adolescent insanity complicated with musturbatic habits, and to certain cases of alcoholism and epilepsy. The following measurements may suffice to illustrate these facts :-

MUNICIPAL SERVE DEPARTMENT IN ADDRESSET, AUGUSTS, AND REMARKS INSCRIPT.

	District		Estimata.
G. H., W. S. W., J. J., W. W., D. F., J. W. T., S. R., F. D., T. S. R., W. H. B., M. C., G. S.,	E	100.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Alcoholism truth trentor. The Alcoholism truth trentor. Hypochimelysteel melanchita alcoholism Alcoholism trapalerer transativ, Alcoholism definional aroundy, Alcoholism definional insurity. Alcoholism definional insurity. Alcoholism definional aroundy. Alcoholism definional aroundy. Alcoholism definional aroundy. Bo. do, Do. do, Do. do, Eptlepsy masturbattics. Eght equatio beniplegia and epilopticism ton- velicism. Old right beniplegia with carly uphasis epiloptic form setimes. Typical epiloptic insurity.

Apparatus for Testing Appreciation of Weight.-The instrument employed for the foregoing observations was made by the Cambridge Scientific Instrument Company, and is described by Francis Galton in the Journal of the Anthropological Funtitute, for May, 1863.

It consists of a box holding ten grooved trays readily movable, each tray supporting three cylindrical weights, all of which are exactly alike in rise and appearance, differing only in swight. The difference in weight between each consecutive pair in a series varies with each tray, the difference being marked on the tray. Commencing with a weight of 1000 grains, a difference of I per cent or 10 grains is the minimum increment adopted ; and multiples of this in each series give as a gradually advancing differential from 10 grains up to 120 grains in the tenth tray. Thus, where W = 1000 grains, and the value of r = 1-01,

Tray No.	2 has	weights	18/20	West	Wri
11	3	-		West	West
111	4	3	Wife	William	Walt
-	5	011	150	Wes	MY !!
165	0	_	Wre	Wes	WYN
100	2	71	WY	Wes	WELL
100	*		With	W	WeH
1.0	9				Will
1	101	14	10.00	Wru	With
1	12	4.0	West	Well	Will

Upon the base of each weight the index of the power of e is suggraved, and these figures occur also on the side of the tray so as to except the attention of the person operated upon.

Commencing with a tray where the difference is coarse we gradually work up to the series requiring more delicate appreciation—requesting the person to take the weights between the thumb and forefinger and arrange them in the order of their respective weights. The last series correctly arranged gives the minimum differential capacity of the subject. The index of the power of τ which occurs on each tray, multiplied by 10 gives us in grains the differential weight appreciated; thus tray i gives us a series of three weights differing from each other by 60 grains—i.e., 1000, 1000, 1180, &c.

Reaction-Time. —A large proportion of paralytic subjects are necessarily excluded from attempts at estimating the rapidity of reaction to the stimuli of light and sound; it is only in the earlier stage of the disease, ere the patient has succumbed to any notable degree of dementia, that a reliable record is obtainable. Such results, towever, have been accured in the accompanying series of patients, special care having been exercised to exclude any source of fallacy, the result being accepted only after repeated observations, and each record being the average of twenty trials.

Stormer-True ex Gerrain Paragress.

		Amoutic Stituctor.	Oplie Historia
T.P	Hemistel, querelos, sprietic,	36	-53
W. W	Schools went, grantles, song, and altrane,	-17	-01
2.36.	Colon, mit-front, alementol,	107	284
W. Inc.	Wild, sensested, receivered, enterropost spiritation,	-11	-19
A.B.,	Melacute mania, granifine, and egoide,	118.	123
T. S.,	Premished with equitorium, optimistic, northly parent	415	727
E.Ca.	Celia, sorebly buller paretyris, result operation, .	-11	-23
B. M., 1	Celia, Sell, heavy, drawately	-21	128
J. N	Brary and described, deproved, such param, .	120	127
C. Po	Diported, slarger system, aloggith,	(23)	127
W. B.	Manie, garratous, obtravioly against,	1-53	-27
TR.	Chereful, rain, alight describe, us contained a	124	-31
F. Line .	Mary, descript,	-25	- 97

Oculo-motor Symptoms.—The eye-symptoms in general paralysis form a highly characteristic and significant group. Both the extrinsic and intrinsic muscles suffer; but, whilst the former present decaugesions in exceptional cases only, the latter or intrinsic muscles of the cycloid exhibit deranged innervation, in some way or other, in almost all cases at some stage of the affection.

The motor decangements of the intra-ocular musculature are indicated by—(a) size of pupils; (b) inequality; (c) marginal centeur; (d) mobility; (e) reflex adjustments; (f) accommodative adjustments; (g) accommodative power. The reflex adjustments (e) comprise the pupillary reactions to—(1) cutaneous or sympathetic stimulation; (f) consensual stimulation; (5) direct light stimulation.

Taking indiscriminately a group of general paralytics in various stages of the disease, the student may meet with one or other of the following popillary anomalies:-The pupils may be extremely small, perfectly fixed to light, so that on exposing or shading the eye, no spevement can be obtained—the pin-hole pupil as it has been called; and it is then said to be in a state of spastic myosis. Nuch a state of contraction is highly important, as being frequently present in general paralysis, lecomotor staxy, and other spiral affections. The pupil may be small, or of moderate size, as the result of paralesis of its dilater or circular fibres; this is called parallytic myosis, and may be due to a destructive fesion in the cilio-spinal regions of the cord; in this case the pupils no longer dilute with atropine. It is a rare affection, but has been recorded by Bacrwinkel in scierous of the medulla obligata. † Unilateral myosis of this description has also been recorded by Nothnagel in discuse of the pour. The pupils may be unequal in size, there may be only the slightest degree of inequality, yet if amerished with other paretic symptoms, or conficious mental. states, the ocular reflexes should be carefully examined ere the student is prepared to discard such inequality as of trivial import. Care, of course, should be taken to exclude operaties of comes, capsular adhesions or retinal changes. The inequality may be very extreme from paralysis of one sphincter iridis.

One of both pupils may be in a state of wide dilatation, acting sluggishly, or not at all, to the strongest beam of light—a state of paralytic mydriasis. Such a condition may be associated with amnurosis.

Or the pupil may be (one or both) irregular in contour; may be + it must be understood that the remarks in this chapter apply calculately to those persistent or gradually progressive impairments of the code motor adjustments, whally irrespective of those variations in the site of the pupil which may pour from day to day, and which include an incontrat factor, such as cortical discharges, &c., or other source of transient stimulus.

[#] Jimra. Mental Science, 1878.

aval or not quite circular—the upper or lower are not conforming to the circular outline; here, again, we must carefully exclude adhesions and effects of old iritis. At times the irregularity is very marked and binarry.

Again, the reflex adjustments may fall, and thus upon stimulating the skin by the electric brush, or by a pin, or by pinching the skin, we do not observe the usual milatation of the pupils in one, or perhaps in either oase; or upon alternately slosing one or other eye, the other fails to exhibit the consensual movements of the normal state; and this, likewise, may be observed in one eye only or in both. In a state of speake myseis, of course, both the foregoing reactions are abolished. "In the healthy eye the consensual contraction, according to Listing, does not begin until two-fitts of a second after the opening of the other eye, and lasts about one fifth of a second, after which the pupil again dilates slowly, and vibrates for some seconds. The consenoual dilatation he observed to commence about half a second after the closing of the other eye, and with diminishing rapidity to continue for one or two seconds." * Then again, the sphincter iridis, either when the pupils are equal or very dissimilar in sire, may not respond to the atimulus of light, or may respond with a sluggishness swiderals morbid. This condition of failure of the light-reflex without a similar implication of the accommodative movements of the iris is called reflex iridoplegia, or the Argyll-Robertson symptom, which is one of creat significance in early stages of takes and general paralysis. Yet again, the sphineter may show no response to light, nor to the effect of accesses addition, nor the movements of convergence and divergence; and the resulting paralysis we speak of as an associative iridoplegia.

Finally, accommodation itself may be impaired to but in one or in both open from paralysis of the utility muscle (tensor choroidez), and, if this be associated with paralysis of the sphineter iridia to light and to convergence, and of the dilating mechanism of the papil, we may speak of the condition as one of cycloplegic iridoplegia, or use Mr. Hutchinson's term, ophthalmoplegia interna.

Any one of these numerous anomalies may present themselves in the achievts of general paralysis. The contraction which occurs during accommodation for a near object, and when the systalls are convergent, must be regarded as of the nature of an associated accomment; yet we must not understand by this that the accommodative movement is involuntary. "The fact that this last (contraction during accommodation) is only an associated movement, does not deprive it of its voluntary character." †

^{*} Quoted by 10m lens, "Accommodation and Befraction of the Eye," Spd. 886., p. 572.

[†] Donders, for oil, p. 374.

The more frequent motor derangements met with may thus be summarised :-

Consensal paralysis.

Tartial reflex indulega-

Complete reflex iridaplegia. Associative iridoplegia. Complete iridoplegia.

Cycloplegic intoplegis.

(b) Loss of consensual movements.

(I) Loss at hight reflex.

(i) Loss of skin reflex or of reflex dilutation.

(4) Both the above purposeed.

(5) Loss of commettee upon convergence only.

(6) All the above conjoined.

(7) Loss of accommutation appendied

As to the relative frequency with which these decangements to the irido-muscular apparatus occurs, we usually find as an early sign a slight, perhaps scarcely appreciable, inequality of the pupils, the sizes of which are otherwise not abnormal, accompanied by a little sluggish delay on the part of the larger in reacting to light, while the smaller contracts and dilates briskly. If the light be bright this want of artive mobility may not be appreciable, hence the necessity of testing in a subdued light as well as by focal illumination. If the patient be now told to converge the evehalls, the pupils contract readily and equably, and we pagard the case as one of commoneing reflex iridiplegis. If this be the case, we shall now almost certainly find associated with it, the loss of the sympathetic dilateticu. which should occur on irritating the skin; for this is, of all other iridal paralyses, the earliest observed. The strong stimulation of a sensory nerve is well known to inhibit reflex actions; and upon this physiological principle, Bechterew would explain this popillary dilatation as, in fact, an inhibition of the assaul light rofter, it is equally produced by noises in the ear, or by attinulation of the sexual organa. siterine pain, &c. The constant association of these two anomalous states is readily explained by the proximity of the sympathetic track supplying the dilator (ridis to that nuclous of the oculo-motor which regulates the aphincter iridia under the stimulation of light.

The large proportion of paralytics who present themselves in an early stage will afford us these signs—viz., a moderate-sized pupil, slightly larger than its fellow, sluggishly reacting to light, even to a bright beam, and absence of the sympathetic dilatation.

In the more advanced stages, the larger pupil will now be found quaits fixed to light or may contract very partially; and, if a strong beam of light be used to illuminate the eye, the initial slight contraction is followed by a sudden dilatation beyond its original limits; remaining whice throughout the illumination of the retina. One eye succumbs to this reflex irideplegia before the other, but, we often recognise a failing mobility in the bealthier organ also, and eventually both become quite fixed and immobile to light. The small-sized pupil (myonic), although usually noted at an early stage of the discuss, is not thus restricted, it may retain this size throughout the discuss, and

he a notable sign even to the fatal termination. On the other hand, mydrianic if not associated with matiect amazonic, is a feature of the later stage of general paralysis. The student would do well, when examining the eye of a presumed case of general paralysis, not only to measure with the pupilometer, but also to compare the dimensions with the healthy eyes of those standing by, under the same intensity of light. When testing the response to shading he should not rest satisfied with the effect produced by covering one eye only, but should note the much greater range of dilutation obtained when both are shaded. He should also, when testing the light reflex, he careful to exclude accommodative efforts. As the small pupil in the early days of general paralysis becomes gradually larger with advancing reflex iridoplogia, it affords us evidence of a deeper implication of the marlet in one half of the pone, as well as of the receival hamisphere of the smus side; for it has constantly occurred to the writer to observe that when undstern convulsions or paralysis occur in the early stages of general paralysis, the dilated pupil is on the side of the discharging or parelying leave.* It appears to us unquestionable that the ocidomotor disturbances, which we have above alleded to, are greater on the side of the more deeply-implicated bemisphere.

The peakend pupil may persist to the end, and yet present no impairment of the associated movements on accommodation, as in the following cases —

	Alest Papitic	Bearting to Light.	Estina .	Consessario Seden	Acommodition.
D. R.	1.75 cilimetre.				ACTION 1
8 A L.	13 millimetres.	lesentile.	Entwister.	Slight or left-inly.	Brisk.

In estimating the agenticases of these scale-motor ascension, the student trustfour or raind the bracking of experimental physiology upon the subject, which demonstrates

(1) That correspond around equivations travel by way of the optic nerve and tracts to the upper quadrigonized aro—i.e., by the nates, its brackin, the external governors, and the judgment of the spice stockmen, which accounts a first mage or level, and from which such excitations pern by the optic radiations in the occupitational region, so visual control of Ferrier.

(2) That section of one optic nerve causes momentar blinderse, together with loss of the light-neffer (eight indeployed) of the same eye, still with persistent contraction of both eyes on stimulation of the second eye—a phenomenon explained by the coupling of the scale-motor modes.

(It) That section of one optic tract issues in former-mass beningso, from paralysis of the corresponding estimal halves of both eyes. Whilst Becktown shows

[&]quot; See Article by Author in Wort Riding Augino Reports, vol. vs.

that, as the log, division of one tract does not affect the reflex construction of the constructor tridle, Knoll bullcutes that in the soluin (with its accuplete decreation at the chicago division of one tract abeliance the light reflex in the appoint eye.

(4) That emploation of one sychall in animals with fairly complete decreasions of chasens (rabbit) issues in atrophy of the nator, its irrothic, and entered generates, with the polymer, all of the opposits side; that in minute with very investible decreasion of a, where the direct fibres perpendents (Reb and Day), such atrophy pertains even equally to those parts on both sides. The representation of the retinal fields in these gauginais contrabelised the optic commissure will vary with the animal; and so belong of the trait or of the quad-question body of one side will have in varying results. Thus flux magnetics * records securdary degeneration of both spoic results in man after destruction of one spc.

In this lower are, therefore, competing the retina with the mesmaphilic centres, we find that section and distinctive lesions on the peripheral side of the gaugiti years in—

Partial or complete unnarrows, with partial but at the concensual reflex and reflex inhagings.

Heavengeness bemiops, with, or writers, impairment of light-reles; certain secondary degenerative changes affecting the times and the quicking-minal extractars with the pulsame affected to above.

To like nations, the represent of those gaughis also tenes to dispersuative changes in both optic nerves, especially that opposite the feeing. Such degratestion are learned to this me, and also not trained controlly degrand the quadricans and the president control to the president control.

On the other hand, the upper are of optic sublitions is connected with the circuit perceptive connected the curter. Its director is followed by atrophy of the certers and of the quadrigousized are, as well as of the lower are respected with the retiral s but it must be represented that the retiral reflects are not atsimilarly below after the mesocylarics.

Size of Pupils.—The pupillary aperture is more frequently found dilated than unduly small and constricted, and a moderate-sized pupil is less frequent than one distinctly larger than usual. In fact, if we take note of all cases of unilateral suphrisms, as well as of those wherein both are dilated, we shall find that it is not with in one half of our cases. If we arbitrarily assume any size up to 2 millimeters diameter to include the must be contracted pupil, from whose 2 millimeters to 3 millimeters for the moderate-sized pupil, and all above 3 millimeters as large dilated pupils, we get the following proportions:—

Small scetmetof papil.	- 1-			- 1	4.	SAME,
Moderate-and, -	1	-		4	13	140
Exlated			-		25	-
					70	
						3.6

In about half the cases—i.e., in twenty-one—one or both pupils measured 4 millimetres or upwards, and in six of these cases both pupils were equal in size. Fory large pupils—6 to 7 millimetres—prevailed in three cases (see Summary, pp. 309-315). In the Summary, the upper

^{*} Control State A. J. Med. Wissenschaft, 1883. (Quoted by Fornice.)

figure of the fraction in col. 2, and corresponding line in col. 3, indicate in each case the size of pupillary aperture and tridal reactions of the right sys; the lower figure and line refer to the same features in the left eye. In all other cases the reactions are alike for both oyes.

Unilateral deviations were noted in twenty-seven cases, the remaining seventeen having pupils of equal dimensions. In sixteen cases the right, and in eleven cases the left, was the larger pupil of the two. We have confeavoured to show elsewhere that an important distinction must be made between early and fare inequality of pupils in general paralysis, or, rather, between the inequality not associated with impairment of the pupillary referes, and those cases where unequal pupils manifest also the absence of reaction to light and to other stimuli. The former, or earlier, sign is an indication of the certical lesions established; whilst the latter, or defective initial reaction, is due to sivancing lesions of spinal and bulbar arrangements.

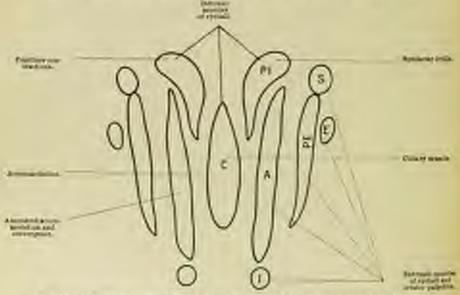


Fig. 19.—Scheme of augmentation of third serve model showing presumed anatomical and physiological relationships.

A. Anterior nucleus; C. Central or residen traction; E. Enternal nucleus of Brace; J. Balerior nucleus inequality of automor); S. Superior or nucleus of Darkinherwitech; PJ. Pastern internal or pale nucleus of Edinger-Westphal; PE, Postero-external or pastern-lateral nucleus.

^{*} If Remarks on Oralia Symptoms of General Paralysis of the Lanaus, with apocial reference to its Chuical Groupings," Best. Med. Journ., April and May, 1996.

Actualists on Four Pour Casas or Galvania Paradorn.

Supling Souther	3	Uga Letter.	.1	The sales	-	Deserved		Selber Dissisting	48	Assertated Morement.	Paperfeat n	ad Borr	Paren	. Kifter	Table 1	e Betto
Both Popula Proof; ;	=	la R	2	Month	2	110	- 8	100	10	Present 11:3	Boll Alsent.	4	-	Percent 10 4	15	200
r. m Shagath, .	#	99	11	0	3)	27			71	2	Streety Absent	Shra	**	2		ŧ
a Extremely a	4	110	=	25	-	31	10	4.5	-01	2	Shappill		-	Ti.	10	10.5
Slight Coutr.,	14	11.0	+		4		11	415		Ī	Very Shapful	-916	-	74.00	41	4
Normal, and the con-	×	75.51	47	641	=	3	-9	113	8	0.00	Both Normal	4	-2	13.6	8	153
Differential of the a	*	19.5	2	110	*	13.6		13.6	*	13.6	in Efferent.	- Spin		200		*
Active, but Lamited, Oscil-1		- 1	0	13.6	-	11	-	-	1	1	Eng	Enggerated.	Z	8	*	1
Desktist,	1	à	7	4	-	+		31	-	2	Darbita.		***	2	-	98
Refressly Limited Sasps.	1	ł	-	2	1	-	Ē	1	=	11	1		i	1	1	1

SCHEMET OF OCCUP MOVED AND ASSOCIATED ASSOCIATED BY

	ACT TO SERVICE AND ADDRESS OF THE PERSON NAMED IN COLUMN ASSET TO SERVICE AND ADDRESS OF THE PERSON	Light Richts	Food Dissination	Comme	British Distriction	Alexander Movement
a, w. m.,	설	Almost fixed. Slight conta-	Slight omles	Normil.	Fisal	Normal
20.0.	3 4	Slight. Normal	Shight. Normal.	-94	-	=
M.F	22	Normal.	Normal.		-	-
A.K	74	46		Haggish.	- +-	Stuggish.
J. D., -	1	Singress.	Sight, then outlines.	Normal.	Normal	Numil
M. n., .	3	Normal	Normal:	**	Fronk.	
La, .	井	10	Normal for both, 20 chlaration.	17	Normal	*
P. S.	4 1	100	Normal.		Normal. Sluggath.	.00
K. T.,	北	-		Normal. Dilutes.	Slaggoh.	-
8.8.	2	~	- 0	Normal	Normal	-
J. P., .	착				Word.	-
J. W	1	Shagain.	Normal, then mullides 29 dilutation.	-	Normal.	Nagual Slagarch
J. L.	24	Shaggish and of limited energy.	Normal but of landed samps	**	State	Normal
n.s.	200	Pinel. Sight.	Might. Normal.		Normal	
A Hir -	3	Firm.	Front. Stegant.	Finel. State.	Thel.	Fant.
SAL	15	-	Front	Front.	Final.	Normal
D. R.	11 13		-0	Front.	- 0	100
I.W., .	11 11	- 14	Find a of expension limited range.	*	*	Einmedy slagged Smitch
G.B.	2	+	Front			Secol
r. W. H.,	3	-			- 10	40.
AC.	の方	9-1	161	ii ii	0.	10

PURITY-FORK CASES OF GENERAL PARALLYSIS.

	1				
Account Hamilage	Firm Areas	Codinar Sense.	Patetin Beden.	Planter. Beden	Gay, Bc.
J. 4 and 1	8n. 5	Normal	Normal	Normal	Brisk.
J. 2 82 24	8c 10	**	Exag.	44	Brisks
J. 3 82 3	Sc. 10	-11		-	Break.
J. 71 Sa 35	Su. 6	50	Slightly Easy.	-	Benk, trank stiff.
J. No. 4	Su 10 Su 00	in.	Shuggish.	-	Beisk.
4. 1k	81. 5 St. 6		Normal	Sheggish	Brick
J. No. 4	8e. 10			10	Bejok.
J. No. 28a 27	8s. 5	Normal but green a blos.	Staggish.	Normal	Brisk, and runs.
†dil.	8n. 35	Normal.	Almost absent.	About	Sways, staggers, and lease to right.
1. 10	Su. 50		Ecop	Erag.	Stiff, tottering, feeble.
1. 25	Sn. 6	Normal but be a pune, year			Doids, but stiff, a little totomic.
1.5	50. <u>6</u>	pess. y pess. Normal but b green.	**	Normal.	Storping, staggering, and falls if eyes for classed.
J. No. 3 Sec. 25	86 fg	g. in teratings, g. in purce.			Disk
4	1	Ŷ	Normal.		Fight by inff-not dragged singlet hemislegia to sphisia, hericental opilogene
Sa 6	Su 6	Normal.	About	-	Stiff, slow, sways.
4	9	Normal	10	Exag.	Brisk, eletty.
J. 18a. 95	8a. g	but green, more like blay than yellow.	Singgish, Normal	Absent.	Brisk and springy.
8a, 16	Su. 6	t = pink, p. sparpis, b. A green s Normal.	Evag. Normal	Exag. Normal.	Slow, interest, Issue to right side.
LNa 180.3	8n. 6	Numal.	St mag.	Singash.	Brick,
J. 20	80.5	#	Slight.	Normal.	Staff.
8s. 24 20	Su. 50	Normal but green wyellow.	Abest.	Sec.	sia.

-			1	_		
	AM	Topic Kenes.	Votal transmittee.	Concessal	Better. Marketon	Mercani.
J. H. W.,	21 11	Fixed.	Fined	Slight. Fixed:	Fired.	Normal.
E.K.	캎	-		Floord.		Fined
W. M.	3	- 1	100	~	3	-2
C. J. C.,.	#	-		-	-	Fond. Normal
3.3	7			-	-	Shaziki.
J.H.	1	_	900	-		Frank Normal
J. L.	2		100	-	2	Frank.
J. C. C.,	6	-	- 10	10.	-	0
J. M., .	Mar		W.	10		100
J. A.,	31	Sight, 90 dilutation Fixed.	44			246
E. E	24 12	Sight, 27 dilutation	Finel. Slight 29 diseases.	141	10	Normal
J. H., .	허	Slaggish.	Maggiek. 26 diletation.	Slight.	Stight.	-
A. S.	+	Normal, Shagosh.	Novat. Shugish, 29 diletation.	Find	Facel.	-
J. T., .	4	Shagosh and of limited mage.	Sleggish, Sleggish,	**	Fixed. Slaggish.	-
T. I.,	4	Slaggish and of figurest range.	Normal. Staggish,	Sleggish	Stight	-
C. O	4	Slaggish	Normal with 27 dilutation,	~	Shagdah. Frank	Singgish
J. M., -	의	Slight with 20 diletation.	Shight with 20 delitation.	Fixel.	FireL	Semi.
J. B.	計	-	Normal with	13	2	
W. E. S.	井	Slaggels Slaggels	Normal Slagged, 29 dilatation.	Normal.	Sliggisk	Normal. Singaple
W. K., .	31	Sluggul.	Normal, then coefficted with 20 dilatation.	Stiggish.	Slaggish Fixed	Normal.
H.M.	事	Singgish. Food.	Normal, Fixed.	Normal. Fixed.	Front.	Might Frost.
B.B.	3	algle	Sight.	Slight.	- 11	Normal
J. B.	41	Shight with 20 dilutation.	Stight, 20 dilutation. Normal, 20 dilutation.	.0	+	**

Note, —The upper figure of the fraction in oul. 2 and corresponding line indicate in each case the six name features in the full age. In all other

_		-	_		
Accom- manufaction.	Visual Annie.	China) Securi	Pelelle Refer.	Plantin- Belles	Hell, St.
J. 1	Sa. A	Normal.	Normal	Staggish.	Suit, broad basis, both down first.
1	No. Dironly	no	Erig.	181	Legs drop, left hemiplegian contrac- ture of left arm, estence identify supported.
Su 20 Su 30	81. 681 19	~	18.	Normal	Brisk.
1	Sa 18	+	Normal Exage	Absent	Leave to left side.
J. No. 1 Sa. 2	100	Normal but gr1		Sormal.	sur.
2. 14 Su 2	82 60 8n 6	Normal.	About.	Knug-	Brisk.
1	,	Normal but y. =2	Enigi clossos.	Slaggick,	Quick, clastic. Both leaves spales
1	-8n_ 4	Normale	Almost ad.	Normal.	Brisk.
J. No. 8	1	Normal but gr. a pelloss	Eng.	Staggist.	Flexion and nightity of both inpresed right elbow; cannot stand. Adhe- tions in both, paymentary deposit
3	3	1	About.	Normal:	Stiff, waddling, but stands ususp- parted.
J. 4	80 M	Normal.	Eng	Slight.	Stat.
tillian:		. 1	Normal	Sluggish	Heavy, tottering.
No. 27	8n 6	Normal but gr.	Sluggish. Normal	Eng	Stoping, best, motosty, inscure,
1 ditalise	9	er crisison.	Enig.	Sleggish	Lett eye strongly ounvergent when are directed to right.
Su 15	Sr. 6	Normal,	Abest,	Normal,	Brisk.
8a. 2	Sa 6	Normall hat gri- repuce.	Normal	141	Brisk.
2 1	Se. 10	Normi.	Eng.	701	Besk.
A. 21	Su. 6	141	Enig.	Singgish, Normal	Right leg dragged; right arm som- tracted; feeble group.
J. No. 1	8e 25	16	Abmat	Kung	Scisk,
J. Su. 4	No. 20	-57	Staggada	Normal	Reisk, springe.
1	1	0	2		Stroping, shuffling, most insecure.
J. 0	80 5 8a 6	Normal.	Hang.	Normal	84
2	1	T.	0.	Staggish	Cannot walk up stared,

of popullary operators, and iridal reactions of the right eye: the lower figure and line refer to the cases the reactions are allke for both eyes.

Light-reflex.—Referring to our table of actual figures, it is found that over 36 per cent, have book pupils perfectly framebile and fixed to the attending of light, and that half as many—i.e., 18 per cent.—show fixity or sluggish reaction in one or other eye. Further, in 11 per cent, both pupils were noted as especially sluggish in reaction and limited in their range, and in 18 per cent, only could it be stated that the pupils reacted normally under the stimules of light. The immobility of the pupils is rigid even to focal illumination of the eye by a convex lens, and with a strong light—as many as 34 per cent, still exhibiting both pupils immobile.

An early indication of commencing iridoplegia is given by focal illumination, for, as shown by the table, 13% per cent., although active to light, show (for a concentrated beam of light) a most limited range of movement, together with an carillation which then tends to middiffication even scaler this bright illumination of the recise. This tendency to diffute during stimulation by light appears to me to be the earliest august of coming paralysis.

Consensual Movements.-When one eye is alternately shaded and exposed, the accommodation being relaxed, we observe that both pupils dilate and then contract. We speak of this reaction in the eye not shaded as the consensual reflex (dilatation or contraction) ; and of the reaction in the eye alternately shaded and exposed, as the direct light reflex. As to the course taken by the stimulus for these consensual mavements, it is a well-known fact that lesions of one optic tract, resulting in himonymists bemisnopsia, do not affect the consensial reaction (KnoV, Beliterers, Basingartes, Ech); and it follows from this that the atimali pass back not along the crossed fibres of the chisama alone, but also by the alternative route of direct filters of the optic track (see diagram, p. 318). In testing the comessoul and direct reaction it is well to bear in mind that the consennal and direct refex dilatations are equal in normal eyes; hence the shaded and exposed eye will exhibit equally dilated popils, since the covered eye lessens the contraction of the exposed eye to just the same degree as the exposure of the latter diminishes the dilatation of the former. It is on this account that we should test the energy of dilatation by studing toti eyes (p. 316).

These reactions were abolished in 43 per cent, of the total cases, and were almost invariably almost where the light-reflex was absent in fact pupils. A cound-rates number, however, of cases of incomplete or counseacing paralysis to light showed perfectly normal concessual movements (20 per cent.), or but slight impairment, amounting to slinggish response or unequal cooperso, on both sides.

The failure of the conscusual movements apparently never occurs apart from importment of the direct or light-roles (the only exception,

if it is one at all, is that of K. F., where very slapping dilutation is noted with normal light-reflex). It appears invariably to follow upon the latter impairment, and thus we find in a few cases (E. S., e.g.), that the light-reflex is impaired, whilst the consensual activity is normal in both eyes.

Reflex Dilatation (Abr) — Every acoustic, tactile, painful or electric stimulus will entail a dilated pupil, and the excitation of the skin by pricking, pinching, or by electric brush, is the usual method adopted for judging of the integrity of this reflex dilatation. It must be remembered that actual sensation need not follow upon this stimulation and its resulting dilatation; thus, stimulation of the amenthetic skin of the homizmenthetic subject will induce pupillary dilatation just as readily as one by done in recess of come and sleep.

This movement, which, as before stated, Bechterew regards in the light of an inhibitory action, fails at an early date. It was completely abolished in 63-6 per cent, and normal response was obtained only in 13-3 per cent. Excitation of any available sensory surface alike fails to produce response in such cases; and, it is of interest to note, that unilateral failure of this reflex dilatation also occurs (being present in 15-6 per cent.). In several of the cases, tabulated, is will be noted that this reflex dilatation failed where the pupils showed healthy and active response to the stimulus of light, both directly and consensually (see U. P., A. S., M. E., K. T., and J. P.). This assemblue condition we believe to be the surfiest sign of approaching iride-more implication; following in its wake comes the aluggish reaction of one pupil to light with a tembercy to dilate on sustained illumination; then a gradually extending prombale superiosis, with which becomes associated the impairment of consensual activity.

Associated Irido-Notor States.—The associated movements of contraction and dilutation of the pupil during the set of accommodation and efforts of convergence are affected only in the later stages of the disease; and in five cases only (or 11-1 per cent.) was it absolutely last in both eyes; whilst, as many as twenty-eight (or 63-6 per cent.) showed perfectly-assual response. It may likewise show unilateral impairment or abolition; and in several cases (F. R.; C. J. C., A. H.; and J. W.) with complete abolition of the light-reflex in both eyes, the associated iridoplegis appeared but on one side, the other pupil soning regorously to convergent efforts. So far from associative iridoplegis (i.e., loss of pupiliary contraction upon convergence) being the invariable supposes to the Argyli-Robertson pupil, the fact seems

[&]quot;It has been conclusively shown by Dondow, as well as by De Rutter and Cramer, that the associated contraction of the pupil occurs with the net of accommodation, when there is so increased convergence of the visual line, and also with the latter when there is no change in accommodation. Lie vis., p. 574.

to be that this latter symptom remains almost invariably persistent up to the fatal issue; whilst loss of accommodative movements (associative indeplegia), when present, is found from the first. The fact that failure of response to light, on convergence, and on shading runs usually on to failure of accommodation also (cycloplegia), is explained by Mr. Hutchinson as possibly due in tabetic subjects to implication of the ciliary ganglion, which forms a crossway for all the nerve-fibres affected.* But we are of opinion that in progressive paralysis the site of the lesson is more often nucleus, the degeneration involving the segments of the motor-orali nucleus and some as yet unascertained connection of this nucleus with the visco-motor, t

From the study of a large number of cases of paralytics abowing these conformator troubles, it appears to its that—

Firstly, the smaller pupil is upon the side of lesion of the contomotor nucleus, or the larger pupil is opposite to the nucleus involved Secondly, that the smaller pupil is the one which falls to art one

ensuarily, if one only shows a failure in this respect.

Third's, that the smaller pupil is the one in which light-reflex is most impaired or is abeliabed, if both are not equally implicated in this respect.

If it be accepted that the path of the light-reflex in through the central decumating fibers of the chiasms to the opposite ocale-motor unders (the decimating opto-genicaliste tracts), as well as to the constrictor centre of the same side by means of the intercentral link, then a lesion of one centre, say the right motor-scall, will intercept the path of attenuit between the left retinal field and both index. But although the left eye can pass no stimuli to either caustrictor papille, its iris can still be affected by stimulation of the opposite eye, through the reused opto-geniculate tract. The left papil, therefore, as well as the right, would be paralysed or fixed to direct light stimulation; but which the left would still be consensually affected, the right would be fixed to both influences. The six cases afforded by our series confirm these views in every respect.

It thus appears that there are two links betwirt the quadrigenical centres and the certex, on the one hand, and the periphery on the other. An upper cortical and a lower or retinal—consisting respectively of the optic radiations from the thalanus and measucephalon, extending to the occipito angular region; and a lower link from the retina to the measurephalon; the upper being essential for vanual perceptions—the lower being also the centripetal paths for the irido-motor reflexes. Lesions of the lower retinal link are productive

^{***} On Paralysis of the Internal Muscles of the Ryc." (Ophthalmoplegic Internal). Moleco Chin. Terms., vol. 21., p. 206.

I For a further discussor on this point see article by antitor, inc. oit.

of secondary changes backwards to the quadrigeniual regions (Obs. 4, p. 306), but not beyond this limit; lesions of the upper or certical link tapes degenerations, which aprend both centrally and peripherieally, involving both cortes, optic teacts, and the intervening gargionic The immediate result of a lesion of one of the lower links is impairment of vision-either complete amagrosis or paralysis of the associated retinal fields (equatorial or homonymous Assiopsis), the iridemotor reflexes being involved only when the lexion is on the peripheral side of the chinama. Since, however, the escape of the crido-motor reflexes depends (in this case, when the nuclei in the medalla are intact) upon the commissural connections, incomplete implication of both tracts must necessarily result not only in visual, but also in reflextridal, distorbances. On the other hand, the cortical, or upper link, when first implicated, has virual disturbances only for its symptoms, for the iridal reflexes are not involved; and thus complete blindness with still active pupus indicates a blindness due to cortical fenou or one beyond the quadrigeninal bodies (this condition as a functional disturbance occurs-e.g., in promis pointing). Eventually, however, the consecutive degeneration pushing to the upper quadrigenment and enterest genicates bodies, &c., leads also to disturbances of irido-motor reaction. The infireidual nuclei, defined by Henson and Voelcker as extending in front of the squeduct, may, however, be picked out by morbid processes; and, in this case, the iridal reactions suffer without any necessary implication of vision, a condition frequently seen in the early stages of general paralysis.

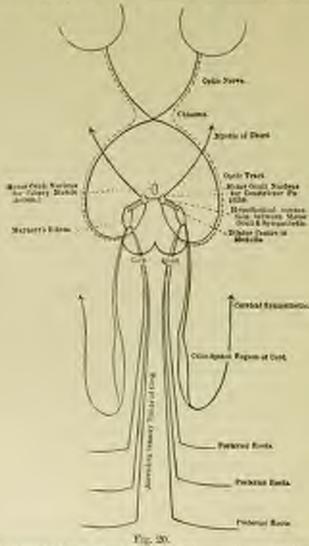
Significance of Certain Pupillary Anomalies.—The true sign of a paralysis of the ceretical sympathetic trunk, or its centre in the cered, is not so much a small pupil, as the failure to dilute upon shading the eye. Mr. Jonathan Hutchimon has shown that cause of such sympathetic paralysis occasionally occur with a medicule-sized pupil.*

It is enstonary, however, to regard the myonic of tabetic cases as due to implication of the posterior columns of the spinal cord, whiles the failure to contract with light, the associated contraction on convergence being retained, is explained by implication of Meynert's fibres contacting the optic fibres with the meter oculi nucleus (see Fig. 20).

Now, if it be recalled that this partial reflex irideplegia is frequently amilitared, we see at once the difficulty of admitting this explanation as correct. Evilateral implication of Meynert's three would certainly lead to double reflex irideplegia; but, since the third nerve nuclei are regarded as tied together by commissural fibres, implication of one side could not possibly affect the reaction to light of either pupil. Latterly, I have been accustomed to explain away this

Notes on the Symptom Significance of Different States of the Pupil," Reals, vol. 6, p. 11.

difficulty by suggesting a hypothetical tract of fibres to exist (see Fig. 20), connecting the third nerve nuclei with the dilator centre of the sympathetic in the modulis. In fact, we may regard every retinal attimulation by highe as also inhibiting the dilating centre in the



medulis (through these hypothetical fibres—see diagram), these fibres being the tract whereby the sympathetic is influenced by differential light stimuli alone, all other stimuli, as from the summous surfaces, passing through the usual course in the posterior columns of the cord direct to the dilator centre in the medulia. Slading the eye, therefore, lessens the inhibitory effect of retinal stituals, and the dilator centre strongly functionates; division of these hypothetical fibres would issue in a failure to dilate on shoring, with, probably, a moderate-sized pupil, whilst estancous and other forces of sensory atimuli still effect pupillary dilatation; extensive disease of the sensory columns of the cord would impair or destroy pupillary dilatation to entereous atimuli, yet not to shoring; whilst disease of the dilator centre in the medulis, or the diffeopinal region of the cord, would abolish dilatation of the pupil for all these forms of sensory stimulation, and induce a myosis from the unpertrained activity of the meter oculi nucleus.

In tabetic forms of general paralysis the oculi motor anomalies almost invariably preceds the tabetic sign of abeliahed inverjerk, and the papels failing to shilate on abading or cutaneous atimulation, a paralytic sayous (moderate) eventually passes into a genuine spastic myosis (I to 2% inva.), from the irritation of a disease process advancing upon the constrictor readens.

Cycloplegic Forms, -A special series of cases of general paralysis exhibit from early days a large-sized pupil, the site of an associative iridoplogia, which passes eventually into the cycloplogic form-i.e., not only do the pupils fail to respond to light and on convergence, but paralysis of accommodation also prevails. Vision is unimpaired for distance, but plus glasses (+ 2 up to + 5 D) are required for close work; such ciliary paralysis is always bilateral. The papels are affected not only through their motor oculi supply, but the sympathetic is also at fault, since no dilatation follows upon shading or sensory stimulation. Hence we have here the triple symptom of paralysis of the accommodative, the constrictor, and the dilator mechanism of the eye, and, as is indicated by Mr. Hutchinson, the ciliary gauglion is the only site, as far as exact anatomical knowledge extends, where the fibras for the tensor chorolden, sphinour isidia, and sympathetic supply are closely associated, and could thus be injured by a single lesion.

It is, however, difficult to account for the slowly progressive nature of the puralysis, and the constancy of the bilateral implication, upon this assumption, and it at first appears rather to favour the view that the lesion is a slowly progressive degeneration affecting the several nuclei of the motor oculi, which, as clearly shown by Bruce and others, is very notably segmented. We regard it as probable that if, with the symptoms of cycloplegic iridoplegis, there is still response to sensery stimulation of the skin, but not to shading, the lesion is a nuclear degeneration of the third nerve; but if the reaction is abolished both for cutaneous stimulation and for shading, the lesion affects the ciliary gaugiton. The remaining features characterising this group of progressive paralysis are:—(1) the absence of notable spinal symptoms; (2) the prefound implication of speech ("drunken speech"); (3) the rapid course terminating in spileptiform convulsions and profound reflections; and (1) its frequent association with constitutional syphilis.

Spinal Symptoms, -In a large proportion of subjects of general paralysis the failure in the vigour and co-ordination of the greater musculatures comes on very gradually and insidiously; the lower extremities remain manifected to any appreciable extent for even two or three years after the oaset of the attack. Locomotion is unrestricted, equilibration is good, the gait steady, firm, and no awaying is induced on closing the eyes. In fact, in 50 per cent, of the cases examined the walk was brisk and not devaid of spring, and no muscular enfectionent was apparent. Yet although the rule is that a gradually progressive paretts occurs, in a considerable number of cases a makies paralytic scipare may occur, rendering the patient temperarily helpless in his limbs, or purmanently paralysed with enalted reflexes and contractions established by consecutive spinal degenerative changes. In other cases, again, we find the deep referres obstished, and true tabetic symptoms obtrude themselves of transmit duration only; on their disappearance, hemiplegia or convulsive seitures may occur, and symptoms of a descending lateral sclerosis come to the fore. The frequency with which we meet with spiral symptom, and the general nature of these meebol signs, may be gleaned from an analysis of the forty-four cases before referred to. In six cases only (or 13% per cent.) were the deep reflexes ascertained to be perfectly normal; in nixteen cases (or 38 per cent.) they were decidedly exaggerated; whilst in some cleven cases (or 23 per cent.) the patellar referenwere both abolished, or both very sluggish, in three more cases the knee-jerk was abolished on one side, and in a fourth very nearly about. Thus we see a very notable degree of impairment of the deep reflexes characterises the affection, and the general results may be thus tabulated :-

DEEP TRUITMEN.

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Knee-jerk normal on both sides
                                          in Busines (12/6 per cont.)
          exaggerated
                                          0. 10
                                                     136/3
    111
                                                              ..
           abient.
                                                     115:9
                                                                    п
           recy, dayyish
                                                                          15 cm
    11
          absent on the wide
                                                                      34 per leut.
                                                     6 68
          meanly about a
                                                     1.45
          eithm rangenated or slaggish
                                             4
                                                    164
                                          ia:
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Increased Knee-jerk, -The enggented knee-jerk, it will be observed, is the more frequent phenomenon; it may be a purely functional disturbance, transient in duration, induced by nervous discharge from the cerebral cortex, and hence by removal of its inhibitory control. In this connection it is often found as the immediate result of a general convulsive seizure, or as actually accompanying the convulsive twitching of general paralysis; on the other band, it may be a sign of organic disease of the spinal cord, and have as its accompaniments the usual motor enfectionent and muscular contractions of descending scierosis. The former association is illustrated by the table, which shows that out of twenty-two cases where the gait was clastic and beish, seven present very notable increase of knew-jerk. It is important, therefore, to note that we have as associated phenomena in many cases of general paralysis, a first elastic toolic, with full maximize rejector of famile, enoggerated deep referee, and pronounced irride-motor paralysis.

The latter association—i.e., of increased lance-jork with structural disease of cord, is exemplified in cases J. M., J. R., E. S., B. K., and may be instructively associated with the ocular troubles as follows):—

Case J. M.—Right arm and both legs paralysed and contracted; knee-jerk notably exaggerated in bith; marked ocular paralysis.

.. J. B. Right arm paralysed and eight; right leg tings; know-jork notably enapprated in right; marked scalar paralysis.

 R. S.—Right hemiphedia with aphasia; right by stiff; kee-jork southly exaggerated in right; marked ocular paralysis.

... H. K.—Left hemiplegia with contractures; keep-jork notably enggerated in right; kerimutal roystogues; scalar troubles.

Besides the above, several (three) of the cases of hemiplegia, with early commencing changes in the cord, were found associated with disturbed reflexes and marked intra-ocular paralysis.

Knee-jerk Abolished or Much Impaired. We see by the table given above that fifteen cases, or 34 per cent., exhibited an abolition of the knee-jerk or its very notable impairment. Of the ten cases in which the knee-jerk is abolished, on one or both sides, five cases are notable for a brisk, clastic walk, yet all present serious eculo-motor. paralysis; whilst of the remaining five, the gait is noted as being stiff and waddling; awaying, staggering, and leaning to right side; stiff, slow, swaying; and two others stiff. In all these latter the pupils are likewise fixed to their usual reflex stimuli. With one exception only, the deep refexes when impaired, abolished, or intensified, were accompanied in all cases by irido-motor paralysis, but the latter condition was often found advanced with a perfectly normal reaction of the knee-jork. Just, therefore, as we may find the association of an elastic, easy guit, or of a spartic or paretic guit, with exalted deep reflexes and advanced intra-ocular paralysis; so, on the other hand, we may encounter the association of a normal gait, or of a

^{*} As regards transient ankle classes in cases of general paralysis see p. 231.

^{*} See "Degrees of Know-jerk classified," by Lectural J. Kold, Leacet, March, 1995, p. 801.

paretic or tabetic gait, with an abelition of the deep referen, and like irido-motor troubles. The tabetic gait, organizating associated with this absence of the kneederk, is possitively disorderly, hurried, spas-modic, and insecure; the legs are jerked forwards, the feet planted wide spart, and the beels brought down with considerable force; there is often a tendency to propulsion; the patient aways from side to side or falls when the eyes are closed and feet approximated, or makes tottering efforts to secure his equilibrium. "Locameter stary may be associated with other forms of insanity, and may in no great degree affect the duration of life; but in some other cases stary appears and is not complicated by mental disorder for several years, when other signs of nervous degeneration appear and general paralysis becomes manifest" (Samage).

Bladder.—It is at this period that urinary troubles arise, and cause much anxiety to the guardians of the paralytic patient. When spinal symptoms have fully developed themselves and the isombar cord is known to be involved, the patient is never secure from possible retention of urine, which, if not relieved by catheterism, may lead to a suprared bladder; an accident frequent enough as to be a source of real anxiety, when large numbers of such paralytic cases are massed together in asylums.

In the earliest period of the disease, retention, or incontinence, may occur, but, as a rule, as a transient condition only; and at this time the patient is sufficiently conscious of his state to draw the medical attendant's notice to the point.

Retention may occur from spasmodic contraction of the sphineter wrether, due to irritation of the lumber cord, a loaded and torpid bewel being a most frequent starting-point for such troubles. It may be due, on the other hand, to the presence of a chronic cystitis and the alkaline urine so engendered, the cystitis having a neuropathic origin not infrequently in changes within the cord and spinal nerves.

Betention for more frequently is an indication of paralysis of the bindder; it is, then, usually accompanied by a dribbling away of water, which fails to relieve the gradually arguenting accomplation, and a time arrives when the organ becomes dangerously distended, and no expulsive power can be exceeded by the patient. Such patients, by being constantly more or less wet in their bedding and clothing, would readily decrive an experienced name. The condition is identical with that induced upon section of the spinal word above the level of the auterior and posterior roots of the spinal word above the level of the auterior and posterior roots of the third, fourth, and fifth ascral nerves—the sensory and motor area for the sphincter wrether. Such section withdraws the inhibitory control of the cerebrum, thus increasing the reflex activity of the sphincter (Lennisies). All such cases

should be uniformly treated by a periodic catheterism, allowing no great accumulation to occur.

A still more dangerous condition arises in certain cases, fortunately somewhat rare. The bladder becomes attenuated, or undergoes considerable facty degeneration, as the immediate result of spinal disease—a genuine trophs-neurosis. Nor is this very surprising when we bears from the results of autopsy in general paralysis how extensive are the trophic disturbances which other organs, and especially the suscender, undergo. In this degeneration the muscular cost of the biaditer especially suffers, and the organ may be emptured by a slight distending force when sided by such accidents as a fall or a blow, or even powerful expalsatory efforts, as in severe vocaiting.

A recent convulsive seizure, or an apopleotiform attack, may leave the patient subject for some time subsequently to paralytic retention; and in our treatment of a case of this nature the state of the bladder should be almost the first subject to enousy our attention.*

A similar condition of the hisbler often prevails in advanced cases of tabes, and, as indicated by Dr. Bussell, may even form the most prominent symptoms and, like gastrie crisis, or optic atcopby, if staxy be absent, to readily regarded spart from the real cause... I have little doubt that not a few cases of atony of the bladder for which the surgeon is consulted are examples of tabes, with the bladder trouble predominating." † Apart from any weil-marked spinal paralysis, recention frequently occurs as the result of simple institution, the accompaniment of profound dementia, with which there is often associated a diminished reflex-excitability of the bladder, the organic reflexes corresponding to the general impairment of the experical spinal reflexes. There is not only the diminished excitation of the spinal centre necessary to initiate the act, but the patient does not feel the need of misturition. It is found necessary in our asylum wards, where some sixty or seventy general paralytics are often congregated, to keep a daily and nightly record of all such inattentive cases, and of all bedridden cases alike.

Enuresis. - Incontinence of urine invariably occurs in the paralytic stage of this affection, as in all cases where the dementia also is

^{*} A well-trained medical effect with many paralytic cases under his case will seem fail to direct the careing staff to keep a record of all such cases, and theck the name insensit by daily reference, morning teal evening, to the starbes's report, and by actual examination of the abilianum. Even under the strictual approximents as accident may still occur at times, as in the case of degenerated massender well of the blodder. It is, knowner, quite instrumable for any such patient, known to be suffering from paralytic controls, to escape examination night and morning.

^{• &}quot;On Erric-recognised phases of Tubes Dersalis" in Disease of the November System. Dr. Buccard, 1882, p. 274.

advanced. It forms, together with like howel troubles the daily source of trial to the name—a burden which may be considerably allowinted by tact and careful abservance of simple rules of treatment.

Whilst retention is produced by section of the coeff above the level of the reflex centres of the sphineter (above the third sacral nerve) by removal of its inhibitory centre, so section or disease on a level with the reflex centres produces incontinence, as will any incompetence in the reflex sensory or motor are. It must be remembered that reluntary impulses passing down the motor tract of the coeff is not act directly upon the smooth susseniar fibre of the bissider, but they act in two directions—(a) on the sphineter arethra or its motor centre in the cord, so intensifying the reflex contraction; (b) on an inhibitory centre in the cord above the reflex apparatus, which antagonises the latter and allows the sphineter to relax.*

The necessity for continuous care and change of bed-clothing in these wet cases is emphasized by the otherwise certain occurrence of hedsore which, in these debilitated subjects, become a fermidable complication to the nurses. The irritation of the skin, by its constant scalings in nrine, develops, moreover, paperlar eraptions over the back, the groin, and thighs, which are absoled by the patient's hands.

Bowels,—Another troublesome and objectionable condition of the later stages of general paralysis, is the paralysis of the anal sphineter, which results in such frequent incontinence of the bowel; the condition, of course, is at once recognised on introducing the finger per rectum, when the patency and want of tone of the sphineter is very obvious. As is the case with the bladder and sphineter urethra, the coreterum can colouterily contract the external sphineter and, or can inhibit its contraction; such motor fibres descending through the coretral pedancies to the terminar corel.

The centre for this inhibitory agency is stated by Masius to be in the optic thalamus. So likewise, energetic voluntary contractions of the feeder and and sphincier arouse the active rectal peristales necessary to initiate defecation, by bringing the excrementitions mass down into the rectum. When once there, it creates the uneasy feeling which prompts the voluntary inhibition of the sphincer set, and allows the mass to be extraded. Thus the net of defecation is in every way similar to that of micturition, it being really a reflex spinal not devise a voluntary inhibition of the sphincter. There is the reflex loop constituted by the sensory nerves of the rectum, and the mater areve of the sphincter and the places superferious inducing peristables; a tract for voluntary impulse to excite contraction of the sphincter: a centre in the coretorum for the inhibition of the latter.

Degenerative changes in the lumbar cord occasionally give rise to *Lumbin and Stirling, op. 10., p. 654. the complete paralysis of the smal sphinoter; much more frequently is it a matter of singgish or incomplete reflex of this muscle than of actual paralysis, as well as a defective toolcity which has been much allowisted by the application of tannin suppositories, a treatment first reconscended by Dr. Robert Lawson.*

In bed-ridden cases of general paralysis, a not unusual symptom is that of frequent alvine evacuation from simple increased peristalsis, not amounting to a genuine diarrhea, but a very frequent "formed" stool; at times, however, the stools become very laces, yet without any pyrexial secompaniments, and due apparently to centric irritation of the major. Epileptiform sciences in general paralysis are apt to be accompanied or followed by such, but are then watery sivine flaxes. Thus is the case of R. E. P., severe, continued convulsions, affecting the left side of the body only, were associated with very copious and frequent evacuations.

A similar condition has been noted by Dr. Bumard in certain cases of takes, and which he regards as possibly dependent upon irritation of the vagal nucleus in the modulia.*

In these cases the flux is probably the result of paralysis of the splanchnics, the vaso-motor nerves of the intestines; and to the resulting transmission of fluid from the blood-vessels into the bowel, with the accompanying increased peristalsis.

The Blood in General Paralysis,—A diminution of hamoglobin is clearly indicated in all cases of general paralysis examined by us. The corpuscular richness varied considerably—in fact, from 75 to 126 per heads unit, the higher register pertaining to cases where maniscal excitement prevailed. No connection is established, however, between manis and such corpuscular richness, since a diminution in the number of red corpuscles is quite as often, and, in our experience, more frequently, met with in maniscal conditions. What is of more importance to note in the diminished colorimetric power of the corpuscle, the proportion of homoglobin varying from 52 to 75 per cent. Taking into consideration the corpuscular richness, we find that the absolute deficiency of homoglobin gives a corpuscular value varying between 16 and 50 per cent. The accompanying table gives the results obtained in lifteen cases of general paralysis at different periods of the disease.

^{* &}quot;Clinical Notes on Constitutes introducted to Investity," by Robert Lawson and W. Bevan Lowis. No. 1, West Kelling Aughan Reports, vol. vi.

^{*} Ophthalogologic Enterior with Takes Deviatio (Dr. Reznard, p. 200). See also size described by the same writer in Discuss of Norrow System, p. 218.

AMOUNT OF MANAGEMENT IN THE RESCO IN CONTRACT PARAMETERS.

	Brougholds Comparable		White- torpostes	Valor per Corpunie.	
T. G. (July Jr. 10).	Pot rent.	Performir our	Performir met.	-94	
T. G. (July Jr. W).	72	196	40	192	
W. W. IANK. 5 L	70	124:6	-11	1-55	
T.C. July 28.	70 70 80	108/8	-94	65	
T.C. July 24.	80	103	-60 -50	-38	
n chart & uh	70 63	110	-30	194	
W. A. (Dec. 16,)	603	83	521	198	
W. A. (Dec. 16, - 1, T. W. (Aug. 4, - 1,	58 50	110 85 90 2 80	20	1945	
	54	23.6	190	90	
3. R. (Nov. 9,)	66	1004	-25	164	
8. 8. (Oct. 9 L.	68:	100-6	-25 -24	-05	
J. H. Dec. 16, -	69	59	-32	109	
J. R.S. (Dec. 16,).	20	91	-98 -50	-76	
Stalle (Aluga 4), or la	62	31-9	-50	-76	
C.W. (Nov. 3, 11)	99	362	92	TE	
L. W. (Dec. 16, 11)	84 86 88 70 82 77 82 77	79	230	75	
AND THE RESERVE AND THE PERSON NAMED IN COLUMN TWO IN COLU	63	914	100 200 200 200 200 200 200 200 200 200	· · · · · · · · · · · · · · · · · · ·	
T. H. (Oat 3: 1		77-7	-23	111	
I. H. (Oct. 2,)	60	11.5	(10)		

In the cases of E. E., J. B. S., J. A., as of several others not noted in the above list, the blood flowed with great aleggishness, rendering its collection by the usual means extremely difficult. In such cases the surface was cold and very pullid, the vessels being undoubtedly in a state of spasm, and instantaneous cospulation was prone to occur, are the blood could be withdrawn by the pipette; no inflammatory complication existed in these subjects. Similar cases of extremely slow owing blood exhibited, on the other hand, abnormal delay in coagulation.

Clinical Groupings of General Paralysis.—We have elsewhere endeavoured to analyse the more constant association of symptoms which characterise certain well-defined groups of this disease; and although we cannot here enter into a detailed account of such, we shall place before the reader a scheme of clinical groupings in which, as it appears to us, all forms of general paralysis may be comprised. Five clinical groups may thus be defined, according to the predeminance of cerebral, bulber, or spinal symptoms, the early or late onset of cither, and the course pursued; they are as follows:—

Orange L.

Paralytic mydriasis ; a partial reflex trideplogic (light).

Increwed psychotic irritability.

Encourse facial tremor and speech treatiles.

Great optimion with protonal descentia.

Group 2.

Mydranic with associated indeplegia rapidly passing into the cycloplegic form—as early symptom.

Frequent myotatic curess, but no contractures.

Late speech troubles.

Acate excitement with frequent convolume.

Very rapidly lated coarse (preposderance of syphilitie history)

Groups St.

Sputtic tuyusie ; a complete reflex iroliquegia.

Absent or greatly impaired knee jurk.

Father of equilibration; locomotor atmy, defective sensibility.

Very delective articulation,

Mash optimism and excitoment.

direct L

Late upo symptome : passilytic mydriasic, a partial reflex iridoplogia (for light conty).

Atanic pursplegia confined to lower extremities (arms do not participate)

Great facial attacy with extreme troubles of speech,

Epileptiform seitures athering in pronouverd mental enterlieuent.

Group &

No ocale motor symptoms beyond to associal inequality,

No contractures, but notable regulatio recessi-

No disturbance of equilibration, becometion, or sensation.

Speech troubles not propounced.

Epiloptiform setrates very rare, but from the first progression dequating democrat.

ALCOHOLIC INSANITY.

Contents. - Attribution and Age. Sunjeptibility at Certain Developmental Phases-Adolescert Period (F. 8.)-Prevalence of Impalse-Inflaence of Sea, Herolity. Epilopsy, Cranial Injury, Assessfral Intersperance—Assessalism of Systemic and Unoved Sensition Arral Hallacountions (J. Jl.) - Delusious of Suspicion-Optimistic Delucions - Clinical Forms of Alcoholism - Mania a Pota - Ambiyopia Cutanome Amerikania-Eclipses-Case of W.W.-Homondal Impulse (G.5) Chronic Alcabalism - Physiological Effects of Alcabol - Evalutionary Period Martal, Sensoral, and Motoral Symptoms (J. Jl.) - Amurair Forms (J. F.)-Conditions of Neutal Beviralshity-Delesional Forms (T. 8.)-Instances of "Environmental Reuntance" - Visceral Hanisus-The Epigustria Voice-Varion Henory States (E. A. F.) - Evolution of Psychical Phenomena - The Nurseus Discharge-Hallermation as Determining Merbed Identice-Augmented Specific Braintance - Sensory Association - Motor Enfectionment J. R.) - Twitchings. Transce. Stolidity - Reaction Trace is Alcoholism. Muscaler Squeme and Crassys - Ocala motor Immunity - Nystagara - Epileptrium Attacks-Remiplegia (F. P. and J. C.) - Classification.

Alcohol is a fertile source of nervous disease, and its implication of the nervous centres is so general and far-reaching, that the resultant symptoms are of most protean nature; no poison, except the virus of syphilis, plays so extensive a rife in the mortid affections and degenerations of the tissues, nervous or non-nervous. Yet, as regards its effects upon the nervous system, it is possible to trace its march with a fair degree of accuracy, and to classify into definite groups the sictims of over-indulgence in accordance with the degree of implication—the depth to which nervous dissolutions have attained. Ere we classify, however, the more or less distinctive forms of such affections, it will be well to glance generally at the insunity induced by alcoholic indulgence; and for this purpose we have impaired into the history and antecedents of this patients, whose insunity was attributable to excessive drinking; of which number 314 were males. And, in the first place, who are the subjects most liable to the different forms of alcoholic neurosis?

Age .- The period of life is here an element which it is important to examine. Were we acquainted with the actual amount of excessive drinking in the community at large, and at different ages, as also with the percentage of those who succumbed to insanity as the direct result of drink, and the time required for excessive drinking to evolve such results, we might, by a comparison of asylum statistics, ensure some degree of accuracy in estimating the incidence of alcohol as a causative sgency of insanity. Such absolute data are at present out of our reach; and we must, consequently, rest content with the ascertained history of our asylum community without reference to the same. Nor is this altogether devoid of immediate utility, since our object is not so much that of ascertaining the exact incidence of alcohol in insunity, as to extract the characteristic features of the neuronis which alcohol induces. Every period of life shows its proclinities towards special diresse; and the action of toxic agencies demonstrates the peculiar susceptibility of the nervous system to their operation at certain stages of its evolution. Some such law would appear to govern the origin of mental affections induced by alcoholic indulgance, since these are certainly far more prone to occur between the ages of twenty-five and thirty, and, again, from thirty-five to forty-five, than at other periods of life. It is easy to assume that at these periods of life the actual number of excessive drinkers is larger than at other times; at present no data emporting such assumption are forthcoming, nor do we see any remon why the age of thirty to thirty-five should claim special immunity. It must be remembered that this ago, from twentyfive to thirty, is one peculiarly characterised by intellectual advance, as contrasted with the more emotional developments and expansion of the moral nature which takes place during adolescence.

It is also the age when the struggle for existence, in its widest sense, makes streif felt upon the organism in fullest force; it is not the period of longing and yearning for activity, for plans of action and castle-building, but it is peculiarly the age of action felos, when the sectile of the man is tried, and his weight as a social unit fairly enti-

mated. It is upon his intellectual advance, which at this spoch is to important and so notable, that his success as a social factor largely depends; for a successful life is the outcome nowadays of a wellbalanced adjustment, and hence depends on a highly appreciative and intelligent recognition of complicated relationships.

It is a period when feeble and indifferent organisations often feel a want for an artificial stimulus to good them on, and many successib. to such persious indecements; and it is peculiarly a period when certain inherited neurones place the individual at a disselvantage in the competition of life. In fact, it is a period when the first great swellings of the intellectual tide make themselves feit throughout the whole organism, and when inherited frailties, corval in their manifestation in parent and offspring, amert the supremsey of the laws of periodicity in development. All such mascent developments are most prone to early decay in dissolutions of the nervous system ; and upon them chiefly appears to be expended the full force of those agencies credited with the proximate causation of immaity. Thus it is that in the moral and emotional ifendogments of the adelescent epoch, sexual and alcoholic excesses tell more directly agen this phase of mental life, and that hysteric forms of insanity and a stunted moral development are so often revealed at such an age. In like manner, this latter epoch of intellectual expansion exhibits the earliest effects of alpholic excess as inducing reductions in the intellectual aphere. and only later on, as profoundly affecting the emotional and moral being of the individual. This is why we regard age at an important element in the evolution of these forms of alcoholic mosnity.

F. K., agod twenty-five, widower, and a warelesseman. When admitted he had from image for six works; had been very wold, establing in specific colled himself. the "Holy One," the "Great Physician". Patient's father it of stall intellect and of intemperate insbits; paternal ands was issue; patient was addicted to excessive chroking from the age of fourteen to that of twenty one, remained temperate for two years subsequently, and has again religied into his former economic. Upon administ he substated great exaltation, speke controlly, and loadly, groing expression to optimistic delusions; he had realted notions conserling his postcular. powers; was "portect in body and mini, and mapaired all others in knowladge and skill;" be but "a perfect knowledge of the livenum frame, is a great physician, and can care all disease." He declares that he can " easily lift half a. ton, and has often raised many hundred tons aloft; all England will become him. ere long; is possessed of enversors wealth." His reserver is always, but he is inclined to be friendly and jorial; expension finded and excited; pupils widely filleted, but equal and of normal resistion; storgue shows matable and extension fee fibrillar tremor, no stayin jerks | articulation is unimpaired | the reflexes are normaly curtamons sensibility is unimpaired. Parient is unscalar and well nearished. Recursation of other systems proved negative,

In a fortnight he was considerably colmer: the same box-ety was passified, but he was so the reasonable as to be employed. This reminister fasted but two weeks, and he relapsed into server manhead contenues, in which with every energing morel, from abrupt redences to jorial humour, he maintained the same exalted, grarelines settless. His liabits new became degraded and fifthy at night, and reseturisation was practiced.

Wix morths after admission, excitement continued malaired, he was unclear, threatening, and demonstrative. Habits of masteriation so repulsively character and open that the liquor episposition was applied locally, and chloral with bounds of potamism gives internally with only temporarily good results. Those habits kept up presistently around to account for the above program made in his case. for he remained twelve months in the asylms see the excitement alasted; even then for several months he exhibited an indexide appeal, laughed immediatally without cases, was resilient, maidy, senseless or irrelevant in his observations, and given also to image gestionistics and germans.

Twenty worths slaped are in wardinfurged recornel.

We must, as before kinted, make due allowance for this age as one offering peculiar inducements to heavy drinking; and for the fact that a certain period, even for those specially predisposed, must chapse are alcoholic excess results in actual mental alienation; but, when all such factors are allowed for, we still think the evolutional phase of this epoch is the chief reason why so large a proportion of mental cases are attributable to alcoholic excess.

The facts as given in our statistical Tables are striking, for cut of 348 males suffering from one or other of the forms of alcoholic inaunity, 29 cases alone occur between the ages of fifteen and twenty-five, whilst as many as 52 occur during the next five years, or 87 up to thirty-five years of age; each of the two succeeding quinquennial periods of life classing some 50 victims of these affections.

Predisposition. - The subjects of alcoholic imanity admitted into our mylum do not exhibit any unusual degree of the insome heritage, the proportion of hereditary cases not rising above 27 per cent, and, consequently, not attaining to the average heredity of all forms of instantly afide. All recurrent cases of instantly taken together exhibit a far higher insone inheritance than this. If we now group together all cases of insenity, epilepsy, and other neuroses, occurring in the family history of these insane subjects, as also all cases of ancestral intemperance, we find such predisposing elements present in 37-2 per cont. of the total number of cases of mule patients. Where ancestral intemperance was the sole ascertained predisposing came, it was almost exclusively limited to the father, and in no case was the mether addicted to this vice. Taking a history of insunity and excessive drinking collectively, we find such present in the case of thirty-one fathers and sixteen mothers, so that the influence of sexual ligitation in transmission is here apparently demonstrated *

^{*} See in connection with the question of alcoholism as a factor in the production of equippey, an elaborate and instructive article, "Heredity and Crime in Epileptic Criminals," by Henry Clicke, Senie, vol. ii., p. 480.

Nature of the Attack,—Taking first the 344 males—manical excitement provailed in 57-8 per cent, of which over 26 per cent are delusional forms of immity, only 6-3 per cent being acute manical states. On the other hand, melancholic depression prevailed in 28-7 per cent; 42 pases were attended with delusional pervenion, 28 were simple melancholic forms, while 12 (or 3-4 per cent.) were cases of chronic cerebral atrophy. The maniscal states were, therefore, considerably in excess of the melancholic forms of alternation, in fact, they were twice as numerous; whilst prenounced descentia appertained to a small section, forming only 8-4 per cent, of the whole.

Taking the aggregate of 344 cases where alcoholic excess preceded the attack of insanity, the first important fact taught us by a glance over our statistics is the essentially impulsive nature of the affection; it is in all its phases a convulsive neurosis. Whether exodement prevails, and the disordered propensities exhibit sudden, explosive impulses; or whether depression, with its frequent accompaniment of hallomation, predominates, and painfully pent-up feeling, or suddenly-aroused terror results in determined violence to self or others; or, lastly, whether they are forms of mental fatuity with depression-the all important feature to be horse in mind is this prevailing convulsion of conduct. The maniscal forms exhibit such impulsiveness, not so much in attempts at self-injury as in a dangerous aggressiveness to others, in destructive fits, in endden, treacherous, and often brutal violence, a tendency which renders these lunation a psentiarly dangerous element in our asylum communities; about 68 per cent, were thus returned asdangerously impulsive towards others. The melancholic victim, however, is more likely to turn his hard against himself; one half of such cases at the lawest estimate being dangerously suicidal, The tendency to esteridal and homicidal impulse is high even in advanced forms of dementia, and it is a noteworthy feature that in those cases of dementia which are dependent upon chronic alcoholic cerebral atrophy, saicidal and homicidal inquite reaches its climax of feequency; as many as 65% per cent, of such forms being determinedly. suicidal, and 83-3 per cent, being dangerously aggressive. The intrinsically impulsive outbursts of alcoholic insusity, whether manis, melanchalis, or demontia prevail, should never be forgetten by those dealing with the intane;

Taking into account only the male alcoholics, age apparently had no distinct influence over the character of the mental symptoms, one half the cases of mania, as of melancholia, occurring up to forty years of age, and the other half, subsequently. We may anticipate the largest number of manianal or melancholic patients to be between twenty-five and thirty years of age, and the next largest proportion

to be in the quinquential periods immediately preceding and following the age of forty. A considerable rise in the number of melancholic cases amongst such a class of insure instricted again occurs at the age of fifty to fifty-five, and a similar rise in manifest allments from fiftytive to sixty years of age. We may, therefore, conclude that although certain periods of life are especially prone to the development of alsoholic insunity, such as the ages of twenty-five to thirty, from thirtyfive to forty, and again towards furty-five, manifest and melancholic forms appear in the same relative frequency at these epocks of life.

If we attempt to explain why the form of insanity should assume in one case the maniscal and in the other the melancholic type, we are able to affeed but little explanation and that purely of a negative character. Thus age is, as just noted, an indifferent element in this connection; in like manner inheritance cannot be stated to have any very definite influence in either direction; excitement does, however, predominate in hereditary insanity; but the proportionate number of maniscal to depressed cases appears still greater among those who afford the history of accepted intersperance. Epilepsy and other neuroses also appear to be wholly indifferent factors. Then again, as regards 80X, it is noted that melaucholic states are to maniscal proportionately more frequent in male than in female inchriates, being but one-fourth in women and one-half in uses. Sex, therefore, does appear to bend some influence in predisposition to the one or the other type of insanity. Lastly, recurrent seizures throw no light upon the subject, depression and excitement occurring with about the same relative frequency in relapsed cases (manis, forty-three, and melancholia, thirty-sevent. Cranial injuries occur in a large proportion of the subjects of alcoholic inamity (189 per cent.), but this element comes in as frequently in maniacal as in melancholic states. Of the circumstances which modify the type of the psychosis ago, recurrence, and cranial injury may be excluded from consideration; whilst sex, heredity, and anosstral intemperance have some influence in this direction.

Hallucinations of Special Senses,—Illusions and ballucinations are extremely frequent in all the acute forces, as well as in a large proportion of the chronic forms of alcoholic insanity; in 344 males as many as 151 (or 38 per cent.) presented such disturbed sensorial phenomena. The visual were the more frequent, and visual or aural were separately more frequent than both combined. But what is peculiarly characteristic of these alcoholic forms of alienation are the illusory and ballucinatory phenomena of the nerves of general sensation and of the systemic or visceral system of nerves, giving origin to delusions of an extraordinary nature, and often of a very complicated system of intrigue. Tingling, prickling, burning, stinging sensations

over different areas of the integrment are frequently complained of ; amenthetic patches are discovered over the skin of the arms and face, and a feeling of general numbness in a limb may enane; electric-like shocks are described in the limbs, and head, and neck, often associated with muscular twitching, or facial contortions; and these asbjective states, induced usually by centric changes, are referred to an objective origin, giving rise to the most varied delinional concepts, such as those of unseen, mysterious agencies operating upon the system-electricity, magnetism, mesmerism, witcheraft, diabolical machinery are in turn invaked to account for these mysterious semutions. In like manner, anusual visceral sensations referred to the heart, lungs, stomech, bowels, &c., become the basis for similar delusional beliefs of a malign. influence within. Belief in Jemoniacal possession is not uncommen, but more frequently is the imagined terture supposed to be produced by individuals known to the patient, who, he believes, have the power of operating upon him from a distance, or have obtained access to his body, and restrict, emilave, and govern the whole life of his organism, control his thoughts, and have dominion over his mind and its atterances.

J. J., aged thirty own; admitted March, 1895. Had been a soldier, and for the past fire years on service in India; he was invalided by "ferre," confined to a military hospital, and then sent home to Rugland. During his voyage home, a "gabranic battery began to play upon him," and he board the roices of his lateofficers, Capt. P., Lient. C., Dox W. and C., talking of murders and other crimes, although they were not present. He has hourd these voices persubsuitly store noming to the asylum; they are always above him, and he points up to a distant. roof of the building where he believes they are located. He often hours the whistling of gas over his head, which, he says, affects him in as " to mip a word. in two," just as he atternit, and confounds the meaning of what he mays-of also affects his memory; this gas is produced by the same agencies as the cuires which he hours. Flashes of lightning show him all the overte of his life. "I have seen my whole life, good and bad, in you back-parel" (referring to an airing-court). The hattery sends electric shocks through his budy, essent a lowey present tack a paint at his opigattrium, twitches up his chest, but does not affect acus or hands. His speech is benthing, and he often, in explanation, own the statement that, " Time rule are speech, and tell us what I have to say at times." Has noticed fool idears, which he know were territoral, and massed by "the electric mathins a" they powent him from slooping. These maleculest agents are treacherously parenting him wherever he give, he knows not why he cannot rid himself of them, although he has "offered them his life." Proquest twitchings of the facial regarder on the left side cover, and he explains them as due to the electric checks, which draw his breath out of him at those times; his "bend shalos," said his eyes "are made to twitch thereby." He admits buring been of very intemperate habita since the ago of eighteen, but had never suffered from delirium trement both his father and mother were excessive drinkers. He bisself drank raw quirits breely. Had never inferred from its or stroke.

Dynamical registers for right hand 56 kilos ; for the left hand 54-m the average of four trials.

Edicameter gives the following measurements of comparative soughlity t-

The of foreigner.		_			or both		r Store.
in themby -	100	-	9	85	71	:10	25
Balt of themb,	- 1			0	**	24	111
Centre of palm, -		-	4	ol.	-	4	34.
Wrist, dorsal,	4			- 0	100	12	111
Write, voler, .	- 1			17	11	8:4	0
Favorer, dorsel.	- 10			23	11	17	25
Ferniers, volume	- 1	-	9	1.9	0	18	10

Sensibility electrical appears good, active, without delay; set be complaine that his legs frequently feel "dead," as he sits at table. Both know-jerks are quite abolished; yet equilibration is are limitabled, he halances will with eyes alread; stands are tipous, and can walk "heel and too "along a straight line; plantar reflexes are good. Has sever had pains in his limbs, but fluiding pites continually pass through his body is "all directions." No eye synaptoms are apparent, the pupils are equal, the reflexes perfect; has sever suffered from diplopis or equilibrations.

On analysing the varied delimins in male alcoholics, which were well expressed in 208 out of 344 individuals, it was found that 131 entertained ideas of persecution; 29 others, religious delimina affecting their moral welfare; and the remaining 48, optimistic and grandiose conceptions; or, as tabulated, thus:—

NAMES OF DELIVERS OF ADDRESS WALLS.

Delauses of Personations—	Comm	Percentage of whole contilling documes)
(a) By poissoing.	24	12
it i By magnetty and inseen, mysterious, agranies,	25	16
let By various other means beyond the above,	5/2	39
Debutter afferting the moral being,	. 29	- 14
Delayous of grandour and of wealth,	45	23
	208	1000

Frequency of Delusions of Suspicion.—Thus, about 63 per cent, of such false nations are of the nature of delusions of suspicion, and of the 23 per cent, of a grandisse and optimistic character, it was also observed that such notions were very rarely namized with discreat and suspicion—the exalted position—the large possessions or wealth of the individual being cited as in themselves the explanation of the malignity of his imaginary focus.

A summary of all the cases of delusions of mysterious or unseen agencies, based on illusory states of general or visceral sensibility, vividity suggests the terrible mental torture which these alcoholic subjects endows. It should be remembered that the prevalence of these latter forms of delinion, based on illusions of the nerves of visceral and general sensation, is much greater than our statistics would lead us to infer, since therein are comprised only definitely expressed states of the kind, while a much larger section exhibit auspicious evidence of these.

Optimistic Delusions. These states of optimism closely resemble those precented by the subject of general paralysis, in the intensity of the false belief, and their geomiy exaggerated character, but they differ in almost invariably exhibiting the feeling of distrust just alloded to, and their far greater fixity. The subject is restmined in the exercise of his exalted mission, or in the recovery of his just rights; his functions, delegated by the Almighty or by a great earthly potentiate, are checked by the unliquity of his former friends and relatives, perhaps by his own wife and children, to all of whose actions. sinister motives are altributed. Aural halfurmations prompt him to action—a voice from the beavens declares to him his mission—yet his enemies thwart him, emleavour to poison him, or otherwise ill-treat. him, and this leads to frequent impulsive violence. Yet, when contracted with the other forms of delesion of persecution, it is found that hallprinations which are found in one-half of these cases are not so frequent an accompaniment of the exalted mental states, occurring inbut one-fourth of the series. The general character of three delusions. man be gleaned from a few typical cases - thus one of our patients calls himself the "Son of God, and the Father of all nations;" another declares he holds the sun and moon in his hands, and regulates the souvemeans of the planets; another has been left a fortune of one willion pounds sterling by Earon Rothschild; another has just produced a great patent whereby his fortune is secured. One acute ease (recovering in the course of four months) declares that he drives six of the finest herece in the world. Noble uncestry is bousted of by some, or matrimental ulliance claimed with members of royal blood; and one of our most acute cases always spoke of his wife as Queen Elimbeth, and was pomessed of fabulous wealth; the son of another was so wealths that he was about to buy up Wakefield.

Delusions of persecution comprise, as we have before stated, nearly 63 per cent, of the whole series, with the very frequent association of bullecinations of the special and general senses. A very large proportion of such entertain ideas of polanting—their food, medicine, or tobacco is drugged; attempts are made to stupefy them by chloroform, to smother them when asleep in bed, and to burn them alive; ideas of murder in every conceivable way are rife; their house is to be blown up; they are to be "cut in pieces and beiled," or divided himb from himb, and "their buried shildren disentembed." Policemen dog their footsteps; sobliers he concealed in their houses; voices are heard next door intriguing with the wife against their life; sats and vermin surround the hed; the wife's

fidelity is frequently called in question. These are some of the more prominent instances occurring in our series of male alcoholics, of which details are affected in the Table.*

Of the Clinical forms of Alcoholic Insanity, -We shall now proceed to a study of the varied forms of alcoholic insanity, under their respective headings of scute and of chronic alcoholism; premixing, that by the fornce we indicate a purely toxic form of instally in which the mental demangement (often very acute as regards intensity) is of mpid course and short duration-a more purely functional durangement, due to the presence of the poison in the system; and that by the latter we refer to the more remote effects of the poists in altering structure, through modifying the nutrition of the cerebrospinal system—an invanity based upon seguric discuss of the brain and spinal cord. The statistics already dealt with when considering alcoholic instanties generally, have presented us with some 10 per cent, of cases running a rapid course towards complete recovery; but in which there are also some 40 per cent, of others whose recoveries were very partial, so death resulted, or the patient remained an addition to the chronic insure community. It is upon such rategories we shall now draw for illustrations of the various phases pressured by the mental percentions induced by prolonged alcoholic excess.

Acute Alcoholic Insanity.—Under this term we comprise ments a pote, or the sente alcoholic delirium of Magnan, and delirium trement, se "febrile" delirium tremens of Magnan.

Menia a pers (neuts alcoholic delirium; delirium ebrianum).—Our patient estably comes before us in a state of soute maniacal excitement, and with some such history as the following:—He has been for a long period addicted to intemperate habits—perhaps, net so much continuous, forcy drinking, as repeated excesses, often with prolonged intervals of comparative subriety between the bours. There is probably a class to one or more attacks of delirium treasens, force which on recovery he has shortly relapsed into his former excesses leading to an acutely-delirious outburst.

It is by no means unusual to be told that, for several weeks prior to the sensure, there had been entire abstinence from alcoholic indulgence; but that the health had been notably affected, with gastric disturbance and general untakine; nervous symptoms had been prominent, and mental instability, moreoscues, irritability, insumoia, hideous dreams, and nervous startings had been witnessed; and that, consequently, on the occurrence of some moral agency, shock, grief, disappointment, &c., an exciting cause is afforded sufficiently potent to

^{*} For a citizent study of the personatory definions prevalent in various forms of insurity, see "Insurity of Personation," by Bend Senschägen, Journ. Mental Sc., col. al., p. 500.

develop the attack of mania. One enquiries probably elicit the fact of hereditary predisposition to insasity-possibly of ancestral intenperance; but especially are we likely to discover that the subjects have been regarded as congenitally defective in self-control, as wanting in moral tone, and as the victims of a stunted development, in which instinctive desires and impulsive responses predominate ever higher intellectual promptings. The excitement is often one of great intensity; but, in this respect, we witness various depths of reduction, yet all forms are invariably accompanied by characteristic illusions and hallscinations; in fact, the most notable feature of the delirium is the predominance presented by such sensorial disturbance. In typical delivium fromene motor symptoms are as prominent a feature as the sensorial; whilst in the more chronic forms of alcoholism, as we shall see later on, we get both features less emphasised, less acute, and, together with intellectual enfectioness, assuming a permanence wanting to the arute forms.

The special sense illusions and haliterinations are ever of a most distressing nature, usually very vivid, and exhibit the usual mobile state of such conserial anomalies seen in arute mania. This fleeting character is in itself of favourable angury when contrasted with the more persistent fixity, or monotonous repetition, seen in other states: of mental disease, and indicative of an approaching or of an established chronicity. The variable, fleeting nature of the sense-disturbances in alcoholics has been long recognised (Lesigns, Magnan). The forms thus conjured up by the disordered sensorium bear a striking resensbiance to the other form of acute alcoholism, delicitus tenness, as alsoto the phenomena described as induced by certain drugs, notably hyoneyamine (Robert Lauson). As under the influence of bycorpatrine, pleasurable or painful visions troop before the mind's eye incommily / yet the general mood in acute alcoholism is always painful, and the visions, however fascinating in character, begot distrust and suspicion. Much more frequently are these false impressions of a most painful, terrifying uniture; and hideous, loathsome forms surround the victim, Snabos, tipera, furious dogs are seen or heard, and the attendant is transferred by the diseased mind into a field or other dreuled frem.

If we now test our patients carefully, we discover in many a very decided degree of amblyopin—vision is clouded, and the visual activity diminished, and, with the amblyopin, there is also occasionally conjoined a difficult perception of colours (riscovenetopsia). It has been alsown by M. Galecowski that the chromatic annuthesia thus produced pertains chiefly to the composite colours, and especially yellowish and blaish-greens. Impaired or percented sensibility may also be recognised in other sensory expansions, as the offsetory and gustatory;

the palate is in all cases more or less affected, and the aneathetic condition of the upper lip is an early symptom familiar to all who indulge too freely in alcoholis dranks. Similar amenthesias, hyperenthesias, and perverted states of general cutaneous sensibility have likewise been appealed to an explanatory of the many forms of illusion pertaining to the surface of the body from which alcoholises suffer. That these sensorial expansions do become affected seriously in scute alcoholism is uniouslited; but such symptoms are of transient duration, and are far more frequest in chronic alcoholics; they but indicate the taking off "of the fine edge," which all mental faculties sinks unfor from as the result of alcoholic reductions.

Relapses.-Alcoholic excess, long are structural change can be predicted in the servous centres, is amwerable for something more than the more transient functional disturbance described; it angenders a autritive perversion, which is more marked after each attack of arate alcoholism, and which is expressed in a notable tendency to recurrence. This relapsing character is especially seen during the progress of the alcoholic subject under treatment; repeated outbursts of excitement occur, after intervals of comparative calm and often apparent convalencence, ere the case may be considered fit for discharge from asylum-supervision. Thus, in the case of J. J., four distinct relapses occur during one year of his residence at the asylum. and although the remissions were not so complete as in many cases, yet it was sufficiently apparent in his case that each release was characterised by symptoms exactly reproducing his previous state; and that the immediate exciting cause was some trifling moral agency, such as a dispute with a patient, or some trivial disappointment. It is all-important for us to recognise the fact, that the presence of alcoholin the bleed or tissues is not necessary to the continuance of the characteristic delusions of persecution, to which these individuals are subject; it is in the natritive change engendered in the nerve-cells of the cortex through the agency of alcohol, that a more permanent instability of the discharging centres becomes established, and the mental anomalies assume gradually a more stereotyped aspect. Whatever be the centres of the leain which are more prone to disturbance through the agency of alcohol-when ones their autritive equilibrium is uppet seriously by this agency-these centres are prose to sufer first in any relapse, whatever be the exciting cause.

The case of W. W. will illustrate this point :-

W. W., agod furty, coal-major; admitted Petruary, 1885. Mother had been an instante of this asylum, and was said to have died in Postefract Hospital from softening of the fram. The patient was a heavy drinker certifiest smatth previous to his energy into this asylum; an attack of mental discover, the nature of which is unknown, but which was treated at home, served, however, to check his habits of

intemperature. From that time he worked shouldy, at each seastly employment as he could promote, all within a week of his administrative, when he was estand embeddy with symptoms of excitement and racings on religious topics; this specify emet was attributed by his friends, to his attendance at the Salvation Army meetings and consequent scattement. On his reception into the asylum, he was softening scale mental depression, and was too against to offer any information regarding his subjective state; but, according to the certificate, he had accord the delenance that "there were devile imple him, and that a man had come estable his house to attack him," and he had taken up a poker in order to hill him. In a few days, having quietted down, he affected that he learn! people rousing down in the top of his bond, and although he could not remember what they said, comprehended it at the time; was fearful of sleeping at night. Expid our advances experienced, defended and hallocinities disappeared, and the patient was discharged ex weeks where enters.

Hore then, we find, after aims months' abstinence, the recurrence of seate melancholia apparently attributable to the morbid excitement of certain religious services. In every feature the attack reproduced what was previously engendered as the direct result of heavy alcoholic indulgence; and it is well to be familiar with the fact, that the symptoms of scute alcoholism may thus be over and over again reproduced, without fresh excesses, when the cerebral nutrition has been impaired as above-described. It is noticeable how, in the case just described, the characteristic hallucinations and delusions were also freely interspersed with religious slebusions, and how his ramblings brought prominently into relief the subject with which he had been chiefly occupied at the onest of his attack. As Magnan and others have noted in other cases, here also the hallicinations gradually lose their definiteness, a confused voice replacing the abrening ery of "posson"; then the voices are in their turn replaced by an occasional humming sound in the ears, which ultimately fades away upon his receivery. It is impossible not to be impressed, when attentively studying such gradual recoveries, with the apparent obembilation of the illusory states by the strengthening imprenious of objective existences, foreibly reminding one of what occurs occurs occursolly, even in perfectly healthy states, when awaking from sleep; illusory states are then not infrequent ore more vivid presentative feelings force themselves into being. In a case of manie a jotu * (W.R.) special interest attached itself to the visual illusious to which the patient was entject, especially at the moment of waking. was, as it were, a projection of a dresse into his waking hours, fragmeats of the illusory dream persisting and refessing for some little time to be dispersed upon the re-instatement of wakeful consciousness. This state is not unfamiliar in normal health; and a case as known to the writer, where for some time after apparently complete wakefulness, the subject saw distinctly what he conceived to be his own corpse

^{*} See on this print, Majore-Transl, by Dr. Strenfield, p. 50.

lying in a soffin heads his had, and which for some time he failed to resulve into its real elements of a bundle of cicthing. We reasonably canolade that such resolution is affected by the freer circulation in higher certical realiss; and that somes previously ansenic become, on complete wakefulness, once more the site of functional activity. There is a strong presumption that a parallel condition exists in arate alcoholism, and that a projection of hideous dreams and fragmentary detached illusory states are thus intermingled with the realities of waking hours; the whole history of the case during its sente stage is that of a waking dream. The re-energiality of higher cortical planes which occurs during waking may require a certain well-defined interval, and in lies of dispressing one extentent morbid symptoms will, in certain conditions, call thour into full activity as in the movements of paralysis agitass. Thus is a case of Charcot's hemiplegic type of sormbala ngitans, the writer well recalls the statement of the patient that the hand which was the site of continuous fumbling movements during complete consciousness, and especially during voluntary action, remained often quiescent for some time after waking-a very appreciable interval existing before the affected centres were sufficiently energised to permit of their intermittent discharge.

In the case of W. E. it is also to be noted that both he and his grandmother "could foresee events," by which we may infer that both were subject to these poculiar waking dreams, and were and at such moments to confine illusory appearance with actual existence, and visions arose before them in their waking hours. It is by no means annual annugh the insure to discover a power of calling into existence such illusery appearances; and we are frequently told by thom that they have the power of conjuring up almost say from they choose; nor is this to be wondered at, if the snalogy of dreaming be considered; for we opine that the morbid imagery is always ready (in certain cases) to spring into life, but is suppressed by the attentive direction of the mind to presentative states; if on the other hand, such contrasting states are valuatarily suppressed, the merbed imagination may have full play. At all times liable to dangerous impulsiveness, the acute alcoholic is a fertieri more prone to exhibit such impulses at night; and especially, when roused from shuther, at the sussent of making, from the occurrence then of vivid, illusory, and hallurinatory states. A colleague of the writer's thus narrowly escaped with his life a violent attack on the part of a patient, who had concealed beneath his bedding an improvised weapon, with which to attack the medical officer at the night-visit to his beliade; and who confessed subsequently that said night he had imagined his visitual to be under the form of Satan, and planned this means of attack upon

him. Such impulsiveness very frequently betrays itself in suicidal attempts; and we find by our statistics as many as 40 per cent. regarded as decidedly suicidal. According to Bouciereau and Magnan, from 7 to 15 per cent. of alcoholic cases attempt suicide. The latter writer is especially guarded in distinguishing genuine suicidal and bemicidal attempts from more sendents, which are, of course, peculiarly prote to occur in the terror infused by the delusional states of acute alcoholics. Such suicidal impulses may be associated with desperate conduct, not truly hemicidal nor suicidal, but having as its object the relief of the existing torture.

G. S., aged forty seven, married a weekler spierer by acceptan. For two scoutts prior to administ he had been depressed, simpless and had taken but little food. A furtisglat below he would not leave his house, was effect, solies, and obstitute, betraying much terror because to was "to be taken away and secreted hanging." Wife stated that for years he had been an excountrely sottish deriver, but less intemperate for the past are muchle. Beather was inside. Patient was a fairly near-shed, manufas individual, well built, such a heavy, stuped expression, slaggest in all his movements, his whole bearing indicative of great aparty. He was very illience; was reticent, withit, and refused look upon administen. There was no tentometer parallysis; tongue was protrucked steadyld and steadily—it was covered with final epithelis; heart's astom feeble, no maxima. Abdominal viscous apparently free from all but slight functional decangement.

During his first work's constance, when desping under observation, he sublently spring out of bod, threw himself upon a gatient next to less without any protoration, and rearly straighed him; he was removed to a single corn where he was discreted nutrilating himself, having successful in inflicting a deep unisans with his finger nails around the perior.

Up to this period be had been taking morphic; bycorganine it gr. Merck's Extract) was now ordered. A month after admission it is noted—"Much quaster, but still has a hang-dog look, as if such afraid of searthing or semebody;" and a few days later, he became greatly rented and suspicious, attacking his night attendants and follow patients. Chloral (grs. wwi) softwal night and morning.

Manufact suffectioners, especially of the forcer hinds, was now noted; in his wild excitement be frequently tell and fernind binnell badly, so that he had to be contined to his bed in a posted over. So, weeks after administration, the excitement had pushed away; patient was left extremely depressed in spirits and profoundly demonsted, was very restless, and utterly negligest in habits.

He had at this time the report of an advanced general paralytic, but with no label, buyant, or could paralysis. Some paralysis of the massles of depletions subsequently supervised, accommitting very custions feeding. He remained helps less, fastisfales, and extremely demented, dying sunswhat embledly six months after admission.

The case of J. R. (p. 249), is a typical one of manis a pass passing into chronic alcoholism in a subject predisposed to insanity, and inheriting the results of paternal intemperance. Prior to his visit to America, his seizures were of the nature of acute alcoholism; but, upon his retern

the transition towards chronic alcoholism. In the latter stage we observe the tendency to allude to his sufferings as terrible, and to speak in the most exaggerated terms of the tertures to which he is subject. This is a feature highly characteristic of chronic alcoholism; such maggerated statements are not wilful misrepresentations, for the subject fully conneives the terrors he depicts. The suffering is evidently not extreme physical suffering, but a distortion of disordered semations, so that slight pains and discomfeet, from a loss of bulance in comparison, are apt to be magnified into voluminous distressing feelings. Such subjects usually have heavily appetites, gain deak, and enjoy themselves freely, when their attention is distracted from their subjective states; but, immediately they are speken to concerning their debasions, the hypochondrisod self-engressment is assumed, and they begin to lament their pitiable condition.

Cases of alcoholic delirium have been divided by Magnan into three groups, vic. :--

1. Those affected with alsoholic delirium, with may, complete, and rapid convalencemen.

Those affected with alsoholic delinium, of slow convalencemen, with ready relayer.

 Those specially predisposed, who have frequent relapses, and a convolunceance interrupted by delirious ideas, and in which the intellectual disturbance is from the outset much more notable than the motorial.

Chronic Alcoholism .- The establishment of persistent nervous symptoms as the result of too free an infulgence in intoxicating liquors, has been for centuries recognised by the protession. Even in classic times, we find occasional allusion to such states (Senera). Nor, indeed, could we conceive this to be otherwise, if we take into account the exonaive viscosa indulgence of the lexurious class in the later Roman Empire. Nearer our times, Lettson has clearly demonstrated the omeory and motor troubles induced by long-continued alcoholic indulgence; but, it was not until quite recent days (1852), that a group of symptoms was formulated as constituting a distinct morbid entity under the name of chronic akulofiam, and to Dr. Magnus Huss, in particular, is due the credit of clearly enunciating the relationship of this important disease, which in his day was making such and havoe. among his countrymen. Northern nations have always been most unceptible to the alluring temptation of alcohol; the Russian, Scandinavian, and Sostch, being notorisusly addicted to the vice. In Sweden, the consumption of large potations of raw spirit by all classes of the population (and especially of a most impere and peraicions spirit, distribed from diseased potators, which formed the

staple commercial article), proceeded to such an extent as to descand State interference, in which the reigning family and the medical profession took a prominent part, doing much to point out the perficious social effect of the habit, and clock its further advance. The raw braudy thus consumed in Swelen was not only notoriously impure and nucleus, but correspondingly cheap, and the most deleterious effects were wilely apparent. It is, therefore, not surprising that the most valuable treatise upon circuit alcoholism should have remainted from our Sanoinavian neighbours, and that in the chance work of Magnes Hams' we find detailed in no uncertain terms the ominous group of symptoms constituting a disease, whose differential diagnosis before his say had been, to say the least, most obscure and ill defined.

Van-der-Keik † dealt with alcoholism as he met with it in Holisad; and later (1876), Magnan ; has done for France, in his stationate treatism on alcoholism, what Huss did for Sweden; and in our own country, Drs. Carpenter, j Marcet, J Amitic, Willes, ** and Parker, have, amongst many others, contributed largely to the physiological, clinical, and pathological aspects of alcoholic intoximation, and its ulterior effects upon the nervous economy. Nor must we cent to mention the highly suggestive experiments of Dr. Ogston and of Dr. Porcy, †† which gave an great a stimulus to further research into the physiological action of alcohol, and from which have directly emanated the more enlightened views now held respecting the physiological operation of this agent, its true directly and therapeutic value, and its operation as an incitor to morbid change.

It is unaccessary here to do more than very briefly allude to the injurious effects of alcohol on systems other than the nervous. Dr. Carpenter's "Price Essay" did much to popularize true ideas on the subject, poetraying in vivid colours, as it did, the injurious effects of drunkenness upon all the tissues of the organism. The absence gastric catarrh; the hemorrhagic musous membrane, the interstitual changes in the liver and kidney; [1] the atheromatous condition

^{*} Aleskoformus Chronicus, Dr. M. Hran, Stockholm, 1849-14.

⁺ Enforce of Strong Details on the Houses Budy, by J. L. C. Schneider-Vander-Kolk. Drawcks, 1883.

L'Abrahatone, Dr. V. Magnus. Transform by Dr. Grounfield, 1850.

Chesand Absorber Laboration in Health and Discone. W. B. Chippenter, 1839.

Chronic Altroducte Intersection. Dr. Marcet, 1862.

Chambrate and Nacrotics. Dr. Anette. Macrotlan, 1854.

[&]quot; Alcoholic Prareignia. Dr. Wilks. Lowert, 1872.

⁺⁺ As Experimental Enquiry resourcing the pressure of About in the Ventralia of the Brain, 1839.

²² The frequency of the action on the hidrary has been decired by Dr. Ruckinson and Dr. Austin. Motion! Flores and Greater, November, 1872.

of the blood vessels; the fatty changes in various organs, and notably in the heart; the functional disturbances leading to albuminuria, asciles, anasarca, gost, rheumatism, and the long list of nervous ailments; all these are familiar to any one who has paid attention to the subject. It is well, however, to recall to mind sertain established physiological facts as our groundwork for further observation.

- Alcohol may be absorbed through the zerous, mucous, or respiratory surfaces; the last fact was demonstrated by Orfila, who produced drankenness by the inhalation of the vapour.
- 2 It is absorbed unchanged, and may leave the system in an anchanged form, since it has been detected by appropriate tests in all the finish and in many of the tissues. Thus Dr. Percy, relying on its odour and inflammability, found it in the bile, urine, blood, the liver, and the brain; whilst Rudolf Masing, 1854, * and antequently, MM. Laliemand, Perier, and Dursy detected it by the chrome test t in exhalstions from the skin and in the arise.
- 3. As early demonstrated by Dr. Peroy's experiment, it is found in proportionately largest quantity in the beain; evidencing, according to that authority and Dr. Carpenter, a peculiar "elective affinity" of nervous tissue for alcohol.;
- 4. Changes of a profound significance are induced in the blood itself at an early period, laying the foundation for the various times changes which ensue, and which directly affect the well-being of the nervous centres by the isomediate functional disturbances which are induced through the agency of the notritive paledism of the blood. Such changes are the devitalisation of the red corpuscles leading to impaired sention; to the accommission of bydro-carbon in the blood-current, fatty specks in the red globules, whilst it causes these globules to be very slowly reddened on appears to air.
- 5. Paralysis of the sympathetic system, leading also to impaired nutrition and an extravagant expenditure of animal heat.

The effect of alcohol in stanting the growth of the body is a well-known fact; animals may thus be affected when fed from an early age upon alcohol. At the West Riding Asylum a dog, to which alcohol had been administered for a lengthened period, not only succumbed to all the symptoms described in alcoholism in animals by Magnan (nallumination, terror, savage temper, motor tremblings, and paralysis); but the nutrition of the sheleton also became affected, so that a socially degree of mollities and attendant deformity ensued. Upon death, extensive fatty degeneration of the nervo cells and actendes of the

^{*} Die reife ein Tallenhaf at des glassekeitspart eines l'Organisme. Parte, 1800-

t Bichromate of petash, I grass a sulpristin and, 10 grasse.

<sup>See "Selective Capacity of Nervous Tamore for Alcahol," by Dr. Alex.
Robertson, Giospon Medical Journ., 1886.</sup>

cerebrum was observed. The dwarfed stature of our mining community (amongst whom excessive influigence in drink is only ton frequent) is largely due to this cause, associated with the abnormal conditions of their life and strong hereditary proclivities.

Period of Evolution of Nervous Symptoms,—Important as it is that we should, for the sake of statistical accuracy, arrive at sedinite views as to the period during which alcoholic indulgence may be prolonged (are personnel nervous symptoms are indicated), it is apparent, at first eight, that the question is one of extreme difficulty; and, with our existing data, cannot be answered with even an approach to accuracy. Much depends upon the kind of drink indulged in, the specific effects of raw spirit, wines, malt liquous, absurbe, and other drinks being too well recognised to be dealt with here; much depends also upon the quantity releas; the eliminating powers of the system; sex; contain diathenes (as the aguich) where the individual can take large quantities often, are all important points.

As regards assessed inheritance, it is certain that, from this class of the community, drisk resps its greatest quots of the more persisting kinds of alcoholic delicium and chronic alcoholism. (See on this point, Maynon.)* These specially preliqueed to the rapid incidence of delicium upon drinking are readily recognised. We are all acquainted with friends in whose a single glass or two of wine will produce striking degrees of nervous instability; just as we recognise others in whom liabitude, idinguerasy, or other cause permits a continuous and heavy indulgence in alcoholic drinks with but little obvious effect. It is astonishing what large quantities may thus be taken for prolonged periods with impunity; although, eventually, the nervous centres must undergo irrecoverable injury. A picture of the so-called unclosue dram-drinker from the working-classes of Sweden, is thus given by Dr. Hon:—

"He rises at free or six in the morning, according to the season of the year, and suallows, before going out, a cop of coffee, with a given (2 to 2 cm.) of brandy in it. He returns at eight to breakfast, which meet is weaked down with another glass of his favorrite quarts. At discovering repeats the dose of brandy, and often adds another half glass. About few or at a p.m., whom his work is finished, another glass is available of all support at eight is concluded by a smaller blatting. Evering the day, therefore, he consumes from five to six glasses of brandy, is from the to gloss consect of aparet. Such a mode of life is day from being regarded as intemperate."

Dr. Huss has known some who drank every day sixteen to twenty glasses of raw brandy. In the case of J. C., the patient assured me he had frequently taken for days together twelve to fourteen

^{* &}quot;Parients specially predisposed, who, when suffering from alcoholic delicions, have frequent religious, and a convalencemen often interrupted by delicious ideas, assuming more or less the form of partial delicions." Loc. cit., p. 63.

glasses of raw whisky; nor did he regard this so by any means excessive.

As regards ste, it has been affirmed that chronic alcoholism was anknown amongst women. Dr. Marcet in the interesting tables, andortunately, does not help us, as he excludes women from his category, because of the well-known difficulty of eliciting truthful statements in such cases. This, however, is certainly not a correct statement. Females unionbtedly unjoy a remarkable immunity from the disease, as they likewise do from general purelysis; and our experience would lead us to infer that Dr. Hoss gives a fair statement of the case in his statistics, wherein he finds but sixteen women amongst a total of 139 cases of alcoholismus chronicus. The case of R. F. is a well-marked immance of this affection in women.

Lastly, as regards ope. The statistics of Magous Hose fix the 46th decode as comprising the larger number of mees, and the fourth decade, as presenting a smaller proportion, his figures are as follows:—

90 m 30 jm	structi signi	14 com.
20 _ 40	LL .	44
20 _ 20	0	.00
50 , 60	-0.0	23
60 _ 65	T	1
		130 11

In estimating the value of the table it must be borne in mind that allowance must be made, as as all statistical tables, not only for the varying population at such period of life, but also for the prolonged period during which the agent was at work ere the malody was fully avoived; this latter consideration may have much to do with the high number of cases between the agen of thirty and fifty.

Symptoms of Chronic Alcoholism.—The functional disturbances described as present in scate alcoholism become interblended (if drinking be still persisted in) with symptoms imfinitive of structural change, the injurious action of the stimulant become straiged upon the organics; and the mace freely the vice is indulged in, the deeper is its impress. The chief indications of such argunic change are, advancing and persistent mental enfeeblement, with certain equally persistent sensory and motor anomalies. The general unfeeblement of the intellectual faculties supervenes slowly, but progressively; the faculties of attention, of judgment, and of comparison suffer; and memory a specially implicated. The finer semibilities are worn off; the subject is less impressionable and sympathetic, less charitable, as well as more narrowed and solitab in his desires, his advantable sentiments rapidly declining. The imaginative faculties are

[&]quot; An impury into the ordance of the above of alsohol as a postleposing cares it discuss." By W. Maron. Box. and Fox. Morros-Chin. Soc., 1882. Nov. 57-58.

early affected, the higher emotional states are warped, and the whole moral nature undergoes a profound and serious change. "Apothetic, indifferent, stupetied, the chronic alcoholic bestows no attention on his person; he takes no care of his family; he is lowered in all his intellectual, moral, and social faculties, and finds himself violled defencelous to the caprices of his instinctive appetites" (Mayous)" Aural hallnemations are (as in the scute form) still present, and are now no longer transitory phenomena, but often of such persistence as to constitute the chief mental symptom in the earlier stage of chronic alcoholism | the virtim to such sensory disturbances suffers terribly, and not infrequently is driven to acts of desperate violence through their influence. He seeks in vain to release himself from the intolerable persecution of such voices, which bissphere, abuse him, prompt him to commit hideons crimes, or to atter obscene and revolting language. Purvised equally by night and by day, he pusses sleepless hours; often he is found sitting up in bod in a state of suspicion or of terror, declaring his enemies are beneath his bed, or outside the window plotting his destruction. At times the expressions used by his unseen fees are unintelligible to himself, are distant and secrety andible; and he distresses his mind much in endeavouring to attack the peoper meaning to each words; at other times they are load and near, and he will attribute them to bloss who immediately surround him. Old associates are especially accused by the patient of thus testuring him; thus J. N.G. constantly heard the voice of a disreputable girl with where he had associated ; A. Jl. heard the voices of his compades and officers of the regiment in which he had served in India; and, in fact, what Megaan states for acute alcoholic delirium is equally true for the early stage of chronic alcoholten .- "The hallocinations have for their aubicos cithes the ordinary avocations, or the dominant interest of the moment." ! This is but an indication of the change wrought in the last-evolved attractures of the cortex, which are the first to be affected in the dissolutions induced by alcohol. Thus it was that the first patient just agreed (who had lived a reckless, dissipated, and immoral life of last imagined himself to be surrounded by prostitutes who attered the vilest language, and accused him of the most annatural crimes; and so it was that the soldier, J. J., thought that he was influenced by the persons with whom he had recently associated to his military service in India.

The forms of chronic alcoholism which usually present themselves may be conveniently studied in three categories.

- I. Amnesic owes with, or without, delusional perversion.
- 2. Chronic delasional insanity.
- J. Alcoholic terbecility and dementia.

- 1. Amnesic Forms, Cates comprised in this category show the earliest evidence of structural change due to the prolonged use of alcohol; they are of most serious moment, as they indicate that the border land between disordered function and real structural change has been passed. We by no means assert that such cases cannot be relieved-sideed, great relief is frequently experienced by the subjects of alcoholic amnesia; but it is not going too far to insist that abselute recoverability is rarely (if ever) abtained from this stage of alcoholism. The more notable feature characterising this class is the peculiar failure in memory-an instantaneous forgetfulness of events which have only just occurred. Every degree is found, from slight retentiveness up to a complete, and almost immediate, abolition of the intest impression. A patient so affected forgets names, dates, and order of sequence, to an almost incredible degree. If a name not familiar he repeated over and over again, a moment's conversation will often obliterate its memory; even when told to keep the word as a test-word in mind-the recall fails, if the attention be momentarily attracted in another direction. Patients fully recognise their enfectlement and often strive to the atmost to overcome the difficulty, such effects eventually prove successful, and are suggestive indications as to the anture of the lesson.
- J. F., aged thirty-ine, a ther's labourer; admitted in January, 1887. For for morths prov to admission, he had been strange in manner, craften, and of yagyant habits. He was known to be of intemperate habits, but no satisfactory Anthry rould be obtained. Upon administrable was free from excitement and defaction; his intellectual operations were endeabled, but this failure was evidently due to the marked impairment of memory. The following our turnation, held with him in the month of February, illustrates the popular defect albeled two-" What. is the day of the need?" "I duit Jame." What is the present month?" "Don't lane for certain . Normales, as not read one sell," "Blue long have you been been?" Don't remember alogoing more than one night from." "You gave me the same poply pertenday? Def I! I don't resember; if so, I suppose I have slight here begge. He was now told that the day was Monday, February 7, 1887, and was requested to lear it in mind. In a few seconds afterwards he was asked the date, and he replied, with some hesitation, " November, 1886; October, or November, I don't know hirly." He was quite ablirious to the names of all with where he had been associated for some four weeks, and when attempts new scale to impress them sport his memory, he rarely retained them beyond sociation and of any trivial question were put meanwhile, he became immediately oblivious to the preceding impossion. Old familiar alm he sings correctly, both as regards intonsting and morely; but any unhanilist sequence, such as the allebrative degreed "Peter Piper," he blanders over Espelonly and repensively. There is no send-Meximum or dealness, on tendency to ataxic aphasia; his visual impressions are reserved, an tested for colours, and general simulatity is not impaired, as registered by the authorizanter. The dynamicanter regimers for the right hand 25 kilos. pressure, and 23 kilos, for the left hand. After a condence of three months, bestill affirmed that he had only slept two or three nights at the sayless. Events-

ally, this patient gradually improved, and a few months later by was discharged recovered.

The revivability of a former impression as a resultant depends upon several factors; thus, there are-

- 1. The intensity of the previous impression.
- 2. The vigour of circulation and nervous energy.
- The organisation of such impressions in the anablishment of associated seme-impressions.
- 4. The vigour of the faculty of attention.
- 5. The element of time.

Now in the case with which we are dealing, the intensity of the previous impression appears to be of minor importance, but the vigour of circulation and of nervous energy is decidedly at fault. Alcahol in its chronic results induces vascular paresis in various organs; and the brain and spinal cord are by no means exceptions to this rule. Then, again, the conduction along the nervous circuit is impeded in such cases, as proved by the retarded response made to seasony stimuli, eimed or auditory; and this we have more reason to attribute to delay in the sensory are than in the restor are, or it may be due to delay in the transference from the one to the other. Such slaggish teamination can only be regarded as resistance in the nervous are, and as resulting in a diminution of the effective force of the original impact at the periphery. Hence it is, that the organisation of such impressions by the establishment of associative links in the foreing of one nervous tracts into adjacent seess (the third factor mentioned above)-becomes greatly impeded, since this greatly depends upon the vigour of the nervous current, and the vascular supply of the part.

This failure in the organisation of recent impressions was a prominent feature in the case of J. F., in whom associability of ideas was most strikingly enfectivel, and an impression was received only to be the next moment obliterated; very rarely, indeed, did a recent impression act with such rigour, as to call up associated states and affect such a response as to indicate the establishment thereby of an intellectual nexus of ideas. Such organisation is greatly sided by the picestry of attention, which, when directed towards the impression we tend to revive, forters the growth of that associative process whereous a persistent and efficient memory is based. Thus it is that alight distraction of the mind, even momentarily, by directing the attention to any other line of thought will abolish the feeble tendency to organisation of the original impressions which might otherwise occur.

The faculty of attention is in these cases stroff impaired, and the mind tends to wander similarly. Time, again, is an important element here, and in the case of J. F. it will be noted that any name which he was requested to hear in mind could rarely be retained for a longer time than thirty ecconds, or a minute at most.

2. Delusional Forms, -A much larger class is comprised by those whose reasoning faculties are warped, and judgment falsified, where, in fact, delectional perversions form the most notable feature of the case. In these, as in the former class, anomalies of the consorial and metorial apparatus may be present, and to a much more serious extent, exhibiting a far greater persistency than is observed in assite alcoholic delirium; and, in like manner, the other intellectual Similties may be involved, the power of attention enfeabled, and the family of recallection impaired, yet the predominance of delusions in the distinguishing feature of this class. The repeated storms which, in the nexte stage, have swept over the delicate nervous arrangements of sensory or motor mechanisms have damaged these mechanisms to an irremediable extent, the cusational perturbations, the hallscinatory phenomena, over changing and fleeting in the earlier stage, now begin to surgage a more persistent, a more stereotyped form, corresponding with actual atractural change in the sensorium; the intellectual aberrations evolved out of such sensory disorders, likewise lose their changeful nature, and take on a more fixed and persistent character. The exhausting character of the discharge from the highest nervous mechanism during the soute stages has left these centres in a more or less paralyzed state—the energy of their cell elements is expended, or escapes in streams too feeble to produce adequate results; manufactremee prevails; the whole life of relation is affected, and its motor activities eramped and restricted from this cause. The natural resistunce to be overcome in the motor centres, although not actually increased, appears enormously disproportioned to the capacities of the volitional activities, and the subject consequently feels the encreasivment of the environment which must result therefrom registry of this outer resistance, and the impotence of the will, must engender district, missicion, fear, and allied degressing emotional states, whilst the illusory and hallucinatory states afford still more tangible basis for the fostering of a gloomy, suspicious, distrestini nature.

We have seen how meeted sensations may be fostered and enarmously exaggerated by the persistent direction thereupon of the attention. We likewise are aware how emotional states may be atomed to unnatural intensities by the morbid tendency of the mind to dwell thereupon) in delusional states, especially the hypochondriacal class, are festered by the same influence, and the sense impressions upon which they may be based are distorted to an extraordinary degree. Here, again (as indirated einewhere), with the decline of objectconsciousness, there is a corresponding rise of subject-consciousness, and the conception is formed of a hostile and aggressive environment.

T. S., aged fifty-ex, married, commercial pirck, ministed in January, 1873. suffering from his first attack of inamity, of four-teen months' duration. He was mountait above the middle height, strut, muscular, and well-nourished; of somewhat swarthy complexion; hair black, turning gree; irides blaish grey; pupils mount to size and reaction; make and name capillaries deleted. Patient had been of intemperate liabite, but, althrough often drock, reald not be called as habitual drunkard-his brother committed smooth. He had only executly been discharged from a private asylum; where he had resided for six months. He was agitated and empirious when examined; declared he had passed a wretched night, and could not breathe naturally as the "air is the room was exhausted by some means." The instant he places his head upon his pillow be hours a whistling sound, and the raise of his late governor speaks to him; at times, the whistling and the voice are heard in the air above, and even new the vaice is heard distinctly taraving him from cetable the window-"Thou'st made a nice job of threelf, T. S., by getting is here." He treds impelled to accuse himself of extraordinary oriests, such as rearder, poisoning, and a rubbery of £30,000, "although he hours it is not true." The whistling under the pillow produces "an electric current, which calls up a feeling in his hands as if he had taken morphia," When at home, voices outside his window was board threatening his own and his son's life. Patient was a highly-intelligent man, and would talk for hours spen the subject of his definious, which cassed him much mental terture. The social hallocontinue talkhough present at all times, more or loss) because terribly real to him at night, and deprived him of rest. He wrote a good elerical hand, and was actively suplayed during the first few mouths of his residence bern; but, when left to his own resources, he invertably occupied himself in writing out lengthy epistles description of the prosections to which he was subjected. About eighteen months after admining, he taids a desperate attempt to points and lung himself.

The presistency of these definition is pridented by the following letter written these and a half years after afraission :-

CONSPIRACY.

Mr. F.

Duan Str. - I beg you will coul the following without projustice. My first wife's easer's husband, who resides furty miles south of London, is the inventor of an electro-minul-magnetic machine, and other inventions, made, I rappose, aomorbat similar to a camera observa, or camera bacela, bells of which or all use fand at Levels or Wortley that I believe at the list missed places. Fire or six persons whom I know by their voices (but there are many others I don't know). can see and bear all that transpires in the district (and to my own knowledge) within a radius of thirty unles, from Wortley; they can also tell (after having applied the electro-magnet to his head) what my person is thinking, and he is controlled and cannot woold bearing all they say. It is impossible that momentum or electro-builday may be combined. The mind of the individual operated open is affected through a material living agent, it may be through a material fieldcall it electric, call it odes, out it what pur mill, which has the power of tenverous space, and passing obstacles, so that the material effect is communicated one to seether. No man's woman's life is safe that they have any ill feeling or hatred towards, so long as those informal inventions are allowed to be practiced by these. I have been operated upon for operation three and a half years, by the inventor's informal machines; by him, his, and my first wide's relatives, and others who have

a simily lateral towards use, and are intent on schemes to shopten my life, there object is to make use commit excide, then they think they will have their own way in the disposal of all I have, my about \$1,300, which I have made by catheny sharm, and mived out of my wages (salary) is about facty me years. I have an doubt, whatever, in anying that these informal inventions have been practiced on me from the day I was married to my procest rate, or I well presember at times. I was affected by popular roscon, and whisperings close to my head, which way the cases of my being so very services. I am, thur sir, yours truly. T. S.

P.S.—For the last three and a half years they have sent a continual moment of chertre magnetism (so he is what it may) through my head day and might, I am propagated to prove the truth of what I have written, also can refer to parties who still confry the same. If you will come ever and see me, I will give you all the information I can on the subject; also, who some of the parties are, and give you as also where the machines, i.e., are fixed. I have been twice driven from my home, from few of being batharcoady murchered. They constitues send an electric shock through my head and my—"Take that to be going on with."
(here follow absorve and obscure equivates). Dur't imagins I am image because I write this from a broader asylans.—T. S.

Three years after administrative he made are their and pointly accommed attempt to purson binnell whilst employed in the acytims stress; inving secured and real ferred a considerable quantity of practice int.

No words could adoptately describe the terrible mental tertum to which this poor man was deceased, and although, at times (through the administration of equates, charital nearby or employment, and conversation to distract his mind), his approxima were somewhat albeinted—the executes invariably found has suffering, with redoubled force, from his invalide personation. Like most case of this satisgue, les exhibited the restless arraively is discover more tangelds came to his sufferings; some planable explanation of the distolical means employed by his examine. With this object be remarked every book, personal, and newspapering could by his hands upon; and eagerly questioned the moderal officers as to the probabilities of measurement, electro-biology, witchearth, obyte, electricity, and magnetical being the means employed. We will remember his accited expresion are slay when, handing us a newspaper, to indicated a passage buring upon the telephone and phenograph, of which he had be like the first time heard, and which he postprenously and transplanatly/regarded as the adultion to the whole mystery of his case.—Crew of E. S. F. G. L.)

We have already alluded to the resistance offered by the environment to the activities of the organism in its life of refarion, to the sense of proportionately incremed resistance to motor energy, due to the feeble initiatory discharge; in a certain sense this applies to all the mental faculties alike. We find amongst the delusional forms of chrome alcoholism this sense of distruction presented to every form of intellectual operation. In one, identical is impeded—"Thought is fettered and enalayed by the uneven agency;" in another, the faculty of memory is impaired and recollection becomes painfully ichnome, and this is likewise attributed to a similar power; in another, the expressive faculty of speech is restricted, and the patient declares that he is often compelled to my otherwise than he would; he will aften mid, "Now I am speaking my over thoughts; but, by-and-by, I shall be

made to speak the thoughts of others." One patient (J. J.1.) graphically describes his troubles thus:—"As I speak, the force within me will slip a word in two, and so wholly alter the meaning of what I wished to say."

In the case of T. S., it will be noticed that he felt awayed by the unseen influence so far as to feel impelled to self-accusation of crimes of which he knew he was innocent. And just as J. J. believed that he was impelled to speak the thoughts of others, so he was compelled to think as they wished him, however atrocious, however sickening, obsome, or blauthemous the line of thought. In F. S. sgain, the revolting language to which he was doomed to listen-the herrible obscenity of speech, which he hesitated to record in writing-was a notable feature, and was equally prominent in the case of J. M.G. All these are instances of the enthralment of the individual faculties of the mind, leading to the sense of an invasion by an antagonistic environmental agency; the notions character of which is intersely resportioned to the growing sense of helplessness and incapacity of the organism. The patient, J. S., died of an intercurrent affection, and, as a sail sequel to his history, his only son was admitted, at the age of forty, suffering from debasional insanity, as the result of alcoholic excess. He had had repeated accourse of delicious tremens; had aquantiered a large sum of money away by his discipated habits; and was, on admission, the subject of phthinis, to which he excrembed in five months' time. His history was one of persistent hallurinations. and gloomy delusions, in which he often thought himself aroused of atrocious crimes. He was determinedly suicidal, refused food for a long time, and straggled desperately against its compulsory administration. He was muly, suspicious of all alike, could be induced to talk but little upon the subject of his delistions, and never volunteered any reference to those unless repeatedly prompted.

Three cases of delevious intensity the to thronic attacholous fall into several natural groups corresponding with the nervous centres primarily, or more prominently, implicated. Thus, there are those in whom accorded escapilies prepositerate, and in these the centres of special semation, and shieldy the auditory, may be implicated; or the centres for the organic semations emanating from the various vincera; or the centres for the generative organs and the sexual instincts; all leading up to deluzional perversions. There are those in whom the intellectual operations are specially, and often primarily, affected when the deluzions (although often associated with neral hallucinations or hallucinatory states of other special or general semanticus) are not necessarily evolved out of these. Their special character consisting in a primary change in the centres of other intellectual operations, and the resistance offered to the diminished mental energy, is registered as

the immediate antagonism of a malevolent power, which has gained access to the organism. Besides these two categories there is the class already alluded to of the primary amnesic form, in which the faculty of recollection is the one more preminently or exclusively affected.

In the primarily sensorial forms we find aural hallocinations prepanderate; and although other senses (more often those of taste, smell, and general sensation) may be likewise disturbed, in most cases the anditory disturbance is the only anomaly complained of The phenomena observed may embrace every possible combination of articulate or inerticulate sounds. If voices he heard, ther may be distant and scarcely andible, or near and load, or in close propinguity may whisper in the sufferer's earn; they may be above, below, on the right or the left, and may be referred to casual passers by, to animals, or to hirds. Thus, one patient heard the spacrows talking to him as they flitted to and fee; another was addressed by the crows as they flow past him; but, the voice was the voice of human beings when he recognized us his enemies. Certain French writers have alluded to bilateral hallucinations in which the patient lears with one ear threatening, denouncing, or revolting language; and with the other encouraging, kindly, and conciliatory words; this condition we have nover met with in alcoholics. In all such cases, the malign influence makes itself felt in discouraging or alarming terms."

A form of visceral hallucination is, however, often present, which is of great interest as indicative of the manner in which new but morbid groupings arise within the sensorium. It is thus of the epigastric voice, in which a sensation felt at the epigastrium is often spoken of as a "voice" which the patient describes us not an auditory perception but still "a socce" which makes itself understood, and by which he feels himself impelled to act—this was the case with J. H. It would appear that a contric disturbance projected to the epigastric region is associated in some way with a disturbance impressive of the auditory centres of speech; and that the associated sensory change is referred in both cases to the same site. In fact, it may be often observed that any morbid sensation, extansons or visceral, will, in like manner, determine the direction from which an aural ballucination appears to emanate; both phenomena being referred centrally to the same category of malefrent agencies.

An important class is comprised of those whose characteristic decisions and dissions are those of the sexual feelings and instincts. A large number of alcoholics exhibit some degree of perversion of the second feelings, referred by them to an antagonistic agency; but we ware especially allude to those who exhibit this perversion as the ruling spirit of their instainty. Out of such cases, ***On Bilancial Hallaciantics, "cide Magnas, drobin de Nearologie, New, 1983. the most astocmling delusions are begot. A typical case who has been for years an inmate of the West Riding Asylum, refers all his merbid sensations to the generative system, which he believes to be operated upon by various agreedes-electricity, poisons, cambic, redhet from and elaborate merhanical contrivances worked by magnetism, which have been invented by his unseen exemps with the object of rendering him miserable and ultimately insune. Impressed with the notion that these agencies affect, not only himself, but thousands of others who are confined in asylums, he writes manuscript by the yard, revealing his feelings to the Government, and describing the various Ingenious and diabelical means used for such purposes. He sketches large figures in coloured crayens, representing the human form in both sexus, delineating their anatomical structure according to his own notions, in which the generative apparatus occupy a most conspicuous position, and in which are mapped out the course of the "electric fluid," and the structures which are supposed by him to be concealed within the body for such purposes of torture.

During his relapses of excitoment he recorded (on a roll of paper measuring a dozen yards in length, both sides closely written upon) his feelings and maledictory comments deficated to his persecutors. The effusion throughout was conched in the most obscene and revolting language obtractively exposed; in his calmer moments, no one could be more decorous and punctilious in his behaviour or conversation. The case of J. N.G. is allied to this; in him, also, the sexual organs were the subject of delusional pervensions. Sexual hallmens those at night were frequently complained of; and his female persecutor was helieved to act prejudicially upon his system from a distance through the medium of a "mirror." He, moreover, heard lews, inscivious atterances from old associates, who imputed to him various unpateral crimes.

E. A. F., agod filly, married, printer by sampalism; a tall, powerfully built, muscular man, measured prenaturely agod, with a suspecious, factive look, a druky, suffer complexious; pupils action, the right susception the larger of the twee sectional collegest memor; no impairment of articulation. The least's sounds were accordingly weak, but there was no margin, no intermission, and the pulse, which was very facility, was regular. No investity was transable using his action-drum, no interpretate and lang beautificity of interpretation of interpretation. Fatigut had long beautification in encourse drinking.

Upon enumeration be betrayed much nervous agitution, stared at the outing and walls, declaring the room was surpounded by instruments, whereby people in Looks and Bendfael could bear all that he said; certain perfections in the walmoutling he asserted were telephone; the bed he has upon is electricised, and he even new hole the current proving through him. At his own home a telephone were can be easily the floor of his mean, and upon placing the legs of his chanperalled with this were, he could himself feel the electric current; people in adjacent homes constantly spoke andidly through the walls of his home; they were in intrigue with his wife, whose fidelity he distructed. He found that she used select signorery, folding his showl in a sertain matter meant that he slept, he pand so she communicated with his enemies.

Memory was an impaired; but attention good; and his replies were present; be freely admits alcoholic excess.

Sept. 25.—Nine days after administrate still very suspicious; firmly believes his write conscult herself in the building, and goes about looking for her. Thirty grains of chloral given nightly to relieve incomein.

Ort, 3.—In convinced his telescop is poisoned; hears reaces of amount persons. The sounds issue through the ventilating outlets near the ceiling. "Counst you have them now!" Manner very marginize; empassin a private interview, and, when convening, frequently expresses the fear that he is overhead.

Or. 10 — Jurid inflammations constant during his waking hours; asserts that he bound his wife upstore calling out, "Pool, fool, fool !" is quite convinced it is she, and if his interference would but spend half no bour with him, he would also be convinced; hourd his nine this marking, and his daughter's voice last night. He made a most violent attack upon an attendant later on.

Not II.— They galvenise all the chairs, and the current goes through no strongly."

Dec. 7.—Remarked to an attendant who opened his door this morning. "Now or seven !" and followed him closely, it is not nectain with what ignorations.

Jon. 19.—" Hears attendants in the rooms overhead making a bearing noise and talking; " but does not hear what they say,

Fig. 1.—No change of late; spriet, well-conducted, and sleeps well; hanced he brard a sound hat night like a feasile pure talking to him through the ventilators of his room; and feels sumething like an electric current running through his right side to-day—he often feels it; fully convinced that wires convey electricity all through the words; the volces are not usuals in reality, but "thoughts correyed by electricity."

May 4. - Discharged "indicast," at the argest request of his friends.

He remained fairly well-conducted and temperate for twelve months, then reliqued into his stracking habits, which produced an emerchation of his mental symptoms, leading to a second administer righteen months later. The hallmenttime had become for more distressing a said width wilking in the open streets, he beant research people miles away talking to him; response against wite and children returned with reducibled force; he accurate the forces of the general immediaty; had been dangerously violent to her, and had once nearly strangled her. The night proceeding his admission here, he had driven wite and children out of shore, threatening that, if they did not have be would nearlier than all.

His subsequent history was but a repetition of what had preceded this attack; and he left the neglem referred to the course of seven months.

Then we have the class of cases where disturbances of entaneous semulative lead to delesional concepts of a mysterious principle, known or unknown, acting upon the body. Thus, in the case of G. L. the room was surrounded by invisible tubes, from which issued currents of air producing electricity, and affecting his body and limbs—contorting and twisting them into various attitudes, and causing him such agony; often leaving him weak and prostente upon waking in the morning. The unseen fluid enters his ears, and affects his brain; but his malignant enemies always keep "productly at a distance." A very special form of delusion, already alluded to and illustrated, becomes elaborated in such cases as that of J. B. Here the resistance net with by the organism appears chody to affect the intellectual operations, and is a very direct manner. The faculty of thought and speech become impaired, and, as the victim believes, by the direct operation of a power which has gained access to his brain; which rules his obsopits and dictates his very intermede. In such cases, where (as in that of J. B.) no assurey hallusinations have been experienced, we may sufely infer that the centres of the intellectual operations are primarily discussed. Thus we find attention, ideation, memory, volition in varying degrees affected in this class of cases, and delusional concepts evolved out of the resistance which is engendered by such failure.

Evolutions of Psychical Phenomena.—A case of chronic alcolabilism of the purely sensorial form is obviously not one of alcoholic invanity; and it becomes an interesting and important point to trace the progress of the affection from the sensory areas pure and simple to the planes of intellectual operations—to recognise the gradual overstapping of the inundacy line where intellect itself becomes involved and the case relegated to the category of the insane. With this object, let us study the meters and effects of the sensoral disturbances. The halfseinstory phenomena are, as we know, presumed to be due to certain absorbant discharges from the sensory areas of the cartes.

Nature of the Discharge.—If the nervous discharge he carefully considered we shall find it one of high tension; sudden explosive onset; sapid escape; irregular or fieful occurrence. The centres are in a state of extremely mustable equilibrium—a state of sensory hypersethesia prevails. When such anotable centres discharge themselves, one or more of several results may occur. In the first place, as indicated by Dr. Hughlings Jackson, the discharging centre exhausts itself—is, for the time being (in the case of the sensory area), (as improviousles—and has assumed a state of nolecular stability. In the second place, the centres subordinate to the paralysed centres rise into uncontrolled activity. In the third place, the discharge takes a certain course and produces certain secolts.

- (a) Thus, it may react along a motor tract and inue in active movement;
- (8) It may diffuse itself in sensorial realms, producing emotional perturbation;
- (e) It may involve nervous archanisms subservient to the intellectual sphere of mind, and active ideation may be aroused thereby.

Whichever course it takes, whether one or the other or many, it is to be observed that the point for us to consider is the foreing of other and distant nervous tracts which are ferely rendered sure persons to such discharges in future.

Hallucinations a determining Factor of Morbid Ideation.— Let us resert to our original conception of the phases of object-and subject-consciousness. The sensory fibres are the clusturels for those paleatile tremors which arouse the sensory cortex into activity coincident with the presentative states of consciousness. In other words, these vibratile thrills, transmitted up to the centres of general and special sensation, constitute the raw material of object-consciousness. In alcoholism we say there is a general augmentation in nervo-resistance, both in sensory and motor channels.

In the sensory nerves it is indicated by the tingling, prickling, and formication which follow the hypercothetic stage of the cutamous surface all of which phenomena are probably due to the broken-up. current—the nervous impulse interrupted by augmented resistance -whereby successive shocks are no longer fused into a single impulse. Hence, excitations from the periphery do not reach these centres in the normal state; and a decline in object consciousness occurs, with a corresponding rise in adject-consciousness. The centres themselves are in a state of hypersethesia, of extreme instability, and their intermittent, spiemodic discharges must take some determinate course The discharge from the centres of special senses (which is the physical side of a hallseination) may diffuse itself along lines of least resistance in the sensory realist, discharging the numerous extremely minute nerve-granules (the reservoirs of feeling) found in these regions; and issuing in emotional states which require but slight impact for their aronal. On the other hand, if the energy of the sensory discharge be sufficiently great it will break through lines of great resistance and flood the channels of those centres which have for their psychical correlate the significant faculties; or, overcoming the resistance of motor nerves, issue in determinate movements.

In alcoholina the specific resistance of the afferent and efferent fibres is arguented; the former resulting in a desline is object-conveniences whilst the centric discharges opposed by the latter originals the depressing, existional states associated with feelings of environmental antagonism, which is so notable a feature in this affection. Not is the resistance also other than a favourable condition; for, by this means emotional states form a safety-valve for unstable discharging centres—often by motor lines, and so relieve the place of more purely intellectual operations from the fatal results of the inrush of morted discharges. It is only when the barrier of resistance partially gives way that the development of delusional conceptions becomes possible.

Continued discharges from these sousory areas eventually break through this burrier of resistance, but only in certain determinate

finer, which become, so to speak, channelled out, and more and more pervious by the repetition of discharges along the same tract. There is us, that on the psychical side we find that certain ballacinations eventually beget certain determinate lines of thought corresponding thereto; that imagination becomes tinetured by the distressing ballocination and gloomy emotional background and that, thus, the spheres of the intellectual operations become pervaded by such agencies, and strong contrasting feelings and ideas arise, overlulancing the former intellectual being | hence, the genesis of delusional states. The forcing of such tracts, or the more pervious channelling caused by energetic or oft-repeated discharge, may often be witnessed in healthnote the continual recurrence, despite our inclination, of a song we have lately heard, or been suppressed with and the incontrollable tendency at times to hum or whistle over a tane which we in vain attempt to diamins from the mind. Again, the tormenting recorrence of a line of thought, after prolonged and fatiguing mental work, which so often deprives a student of his night's rest. This persistence of sensory and identional excitation is due to a too pervious cleaned exabinited, and loss of higher controlling centers; and it can only arise after discharge from the appearant series, leaving these latter exhausted. So in these morbid states certain tracts become permented, to the exclusion of others, by the powerful but estermittent discharge from sensorial realists, and unstable molecular arrangements are built up in the substrata of the identional centres.

Sensory Troubles, -An early symptom in chronic alcoholism, is districted courses estances sensibility, and tactile sensibility; exaltation of both usually preeding the various modifications, their dimination or abelition. Tinging, prickling sensations are often felt, and formestion is especially frequent; the patient feels as though insects were crawling tenesth the sain-over the third and gletcal regions, and gesinally extending to the trunk and arms-until the feeling is at times quite intolerable; it imficates that a charge in progressing in the sensory trunk and centres. Patches of hypercethesia are often noted, as in the wrist of the patient (J. J2.), where tactile semilility is greatly exalted; the site is also equally see of hyperalgesia. The earlisty of hyperalgesia, when contact causes a semuation as of burning, or of a sharp cutting edge, is also a frequent phenomenos, and m one putient the pevuliar modification called by Fischer polysodonia, in which our point is recognised as twoor three points, was observed. Shooting pains are prevalent in advanced cases, the pain being not infrequently associated with manular shocks, the patient often regards them as due to electric discharges. The excessive exclusion of the sense of pain, associated with spaces and cramps, leads to ideas of the limbs being term,

wrenched off and mutilated. Later, we find numbers and blunting of general sensibility, passing into areas of complete ansathesis (often with an extreme degree of vaso-meter paresis) which, beginning at the tips of the fiegers and toes, creeps up the dersal aspect of the limbs. An impairment of muscular sense discrimination can readily be shown to exist in alcoholic insanity; but, for the results of actual measurements of such impairment we must refer to the chapter on general paralysis (p. 298).

Motor Symptoms.—The group of symptoms described under the head of sensorial anomalies, though highly characteristic of chronic advakolism, is by no means necessarily distinctive of this affection, since such symptoms may arise (individually or collectively) in other nervous diseases: the same remark applies also to the mental anomalies exhibited by alcoholics. Ordinary forms of delusional insanity often show the self-same symptomatology, the dementia of later stages of alcoholism being scarcely distinguishable from other non-alcoholic states of mental decadence. Even the sumset type referred to, may be recognised as sequent occasionally to other convulsive pouroses.

It is in the motor anomalies that we find the most definite indication of an alcoholic stiology, for they especially present a distinctive group rarely, if ever, exhibited by other neuroses than the alcoholic. Perhaps too much emphasis has been laid upon the sensory and mental disturbances of chronic algebolism to the exclusion of the motorial in the diagnostic indications usually appealed to; for, eetainly, the motor group are the "tell-tale" symptoms which most clearly indicate the agencies which have been at work. It is not, however, by the grouping of such symptoms (whether sensorial, mental or motorial) that we shall be chiefly aided in eliciting an alcoholic factor; we must chiefly rely upon the fliatorical aspect of our case—the mole of evolution of such symptoms, and the Nucleary of the disease towards fresh nervous implications. Here, especially, do we recognise the seiratific process pursued by Magnan in his classical work, when indicating the tendencies of alcoholism to pass into dementis, or general purelysis. The tendency allished to more particularly at this phase, and upon which we do not think sufficient emphasis has been placed, in this the morbid process due to alcoholism svolved in sensory areas over tisule to be translated into the motor realize of the been, establishing necessarily a co-existent disturbance in what we may speak of as the motor evalue of the mind. However acuts, however persistent may be the aszaccial discurbance, we shall always recognise a tendency towards this translation in physicomental terms the delesional distortions being often nothing more than seere symbols of motor enfeeblement which may not be so obtensive a symptom to the abserver.

J. R., aged thirty-law, engle, a bischereth; admitted November, 1983. He had previously been an issuate from August, 1882, to March, 1882, and was then discharged as reliciont. Five years ago he suffered from a blow on the head by a steer in a quarry falling open him. Upon leaving the arylam he went to work in a collisies, list was soon thrown out of employment by a git accelerat, when he returned to irregular habits of life, drinking very heavily, and specify developed mental agreement. He became visitent, and talked much of the tora, record and stars. His enter stated that patient's lither was a noticious displays, that three of patient's hoothers were excessive dichizers, and that two others, as well as a meter, had died of pithons. The mother and her parentage, however, were bradily and temperate. Patient began drinking raw spirits at the age of sixtems, whom employed in "bottling" at a spirit-store. Since this time he has wantered to said fro about the country, often last night of for years by his relatives; but he remained to the end a very heavy finales. At times he would reappear amongst his relatives, shooking them with his dissolute habits ; secreting spirits, and deinking by the pint daily, in spits of every effort to restrain him. During his second reasionee at the asylans he was excited, incoherent, incomnatly garraken, resilies, and cratically "has the un and recen-half the mour in his famil." He was destructive of elothing. He had a sumewhat imberile exposuriou. was good-humoured, yours, and talked published. His fare was this, complexes early, checks and uses ducky; the pupils were equal-consensual, refer, and associative movements were sinive. There was no defect of articulation; no emocular tremor; was of spare habit, weighing US Da.; height, 5 Ht. 7 Inc. Thoracic and abdominal systems appeared mental.

Some four results later by still quotienes mannical a gratespay, pretends to be timed and bumble, picks the patient's pockets, upositing all the ward, and delighted with the mississed he has done. He commond for twelve months an intente, and was then discharged—"recovered."

He was re-admitted for the fourth and has time in Nevember, 1887. At time date he was in a state of continuous mischael excitement, instilly stark solved in his toom, crawling upon hassis and know, degraded in his labels, and requiring marked broding. He was still in a jocular humour, limphed much, and grow absent random replies; matched things out of the extendint's burde, greened application much distributed much. He was very time, his tensories dailing; facial capillaries much dilated; pupils were equal and melicy; deep reference record.

Her, 2.—Has become very southenly fields, nation would in his yest, and is indicated in "slouble spr;" is still remained, but matters more to himself; tongue remarkant booses.

Dir. 8—Cars past support himself with his fort write spart and bands against the wall; the first are purplish, with dark lived patrices; shis looks tense, sweller, and glassel; the solos of fort are bintered; both first are of my coldman, and are kept somewhat rigid, but there is no greatly continuous; both know-perks are sattenedly alaggest. He takes a wide basis of support, stand-live seach, and tends to roll error on his bend; begges is protrailed in a sirrorly theken, first on one side, then on the other; no label tremer; while load, buildness and lamb; bands breadly much with collusting efforts; much twitching and corrugation of brow enaction, and also of facial massive generally; frequent sudden startings of the body and limbs. He is still bunksment and possin; limbta degraded; mustifility is not such impaired in the limbs.

Dur. 10.—Again imported; malks, however, insecurely; know-jeck almost abeliabed to right leg. but somewhat brick on left ride. Ho is garrillous, inco-logent, juming, and mischiovers.

In this connection, therefore, the further evolution of symptoms has a topographical significance, and the morbid lesions have their site indicated in the motor areas of the cortex, or the ganglicaic manes at the base. The certical motor-areas are especially indicated as those carliest implicated; upon them seems to fall the full weight of the texic agency : these, the formtain-heads of volitional activities, have their energies impaired and sitiated. It is no disorder of co-ordination which we witness here; it is that of a genuine paresis an absolute impairment of energy in the highest motor mechanisms. Far different is it with an allied affection of the pervous centres, also associated with psychical disturbances-general paralysis. It is characteristic of this latter disease that the implication results in disorders of co-ordination; in it, also, the most special muscular adjustments are disturbed, but in the direction of their co-ordinate action, and not so notably in an actual distinution of motor energy. In another affection also, a system-disease of the spiral cord, apt to be associated with special mental symptoms (that of locomotor staxy), we also find the muscular power uninquired, but the associated groupings of nuscular movements viriated.

Motor impotence, therefore, not inco-ordination or staxy, is the distinctive feature of alcoholism of the motor sphere of the cerebrum. How does this motor enfestioment betray itself! The earliest indication is usually a notable degree of the suscender fressor, implicating in the first place the fingers and hand, and gradually spreading up the arm | in the next place involving the tongue, lips, and articulatary muscles generally; and lastly, extending to the foot and leg. This tremor is always more marked in the morning and may be dissipated by a glass of spirits; if at first not obvious, it may eften be brought out by prolonged extension of the arm, any slight voluntary exertion tending to establish it, when it appears as a regist and the ompliation of the fingers and hand. A still more important sign, however, is that of manufac frauding, varying from the twinging of individual fibers to a somewhat course fracteular contraction, implicating those muscles which comperate in the most special forms of movement—the lips and longue (as in speech), the correspondent and orbitalisms palpelowron (as in emotional expression). We have on a former occasion referred to the much more frequent implication of the brow someter at associated with disorders of attention." Occasionally, the spannostic action of the orlicularis palps tearum is such as to distort the features into sudien and changeable grimaces, or the whole muscular apparatus of tips and mouth a shaken with a universal tremor; or the head said neck may be violently jerked to one aids by the convulsive action of the moleni and stermo-magnishes, as in the patient, J. J., who attributed the movement to electric currents applied by the medical officers.

^{*} No. Art. Med. Jorna, Aug. 20, 1992, p. 400

When the facial muscles are widely affected, the subject often presents a highly characteristic state. Immobile fixation of the facial muscles gives a stolid aspect to the expression, whilst silent and undiscurbed; but when remed to converse, the effort at three causes such universal tremer as is seen on the eve of a flood of violent, incontrollable wroping, or upon the coast of an explosion of possion. The tremulous convulsive wave which pusses over the face can be often aroused by prouding questions upon the patient, or may slight confusion. Convolute jerking of the tangue may be complained of; thus the patient, J. C., when recovering, especially alluded to the fact that he no longer found his tongue "jumping in his mouth." The patient will often recognise this muscular failure, and when speaking will put. up his hand to conceal the mouth or atendy its movements. Fire course with this muscular twitching, parents of the tempor proceeds. its movements become generally impeded, and speech is thick and bisrred. The stalidity of aspect is due to defective tone; and when voluntary innervation occurs, then only is such stelldity dissipated; yet arregular asymmetric furrowings of the number of the beaw are often obvious, due to irregular contractions or paralysis of the antagonistic groups. An excressed reaction-time is a notable feature in alroholic intantity, and although in a large percentage of cases examined the response to accustle as well as optic atimals showed this retacilation, the delay was more uniformly present in the latter than the former. Taking the average range of accounts reaction-time as An to All of a second, and of optic reschantists as All to All of a second in normal subjects, as given by the several authorities already. quoted (p. 163), we find, on reference to the following table, that outof the recenty-six cases of chronic sleebolism, twenty exceed this maximum for acoustic stimuli, and out of twenty-four cases examined, twenty-two exceed the maximum for optic stimus.

REACTION TIME IN ADDRESS DESIGNATION.

The state of the s	Avenue Manuales	Opti- Standin
	200	360
45, H Mark resemble toward	-14	-23
J. M., Chank abstraction thinteen of presenting	+16	-21
H. W., Chronic absolutions, debusional insurity, richest,	-17	99
H. U Insurrous Summittel, delactors of perservices.	*15	-21
W. W Chronic shuddling, demanted, market Brights',	-15	755
J. C. Wight seems, Sufficientiess, sugments, fresendo	M: 415	4
E. L., Chronic alcoholium, Jat'erstustusm med alcherum		
of anything	150	-25
R. B., Chrone mindrates. Approximates on respective	171	25
J. P., . : Chrone absolution, bull-circuites, delevious of		
permission a service a	103	25
II. A.c Chronic mechanism, distances of percention,		
military and a second	120	*26

RESERVOY-TORK BY ADDRESSEE DYNASTRY-CONSUMER,

Alleria.	Planettes.
J. M., Estern digression, worlds, expenses, 21	24
G. M Membra pota, arrival, rability,	25
W. S., . Paletic, deputed, treashorms, homicular,	-10
P. T Chroni attabolism, ballaciantum resperant. 21	(Bulli)
A. S., Defenies of presenting print renderma,	
Associated,	23
M. H. L	383
J. G., . Cleme abolicing delenger of powersters,	197
J. P., . Chemicaltelling president with hardway, 22	139
A. F., Classical scholaring models married	29
J. K (Identity descript, deposite, deposite, 12)	-29
J. W. Demotic, mich infollower of manage sparity, 28	-97
A. K., Cala, indicate and despatial,	907
J. T., Soprior, Mohil Julie, Irradices. 24	23
d. li Impraded, maniaral, corious, regulator, 28	.00
J. K., . Dalm describel, garages, sheladed,	200
W. P Chann globbins, America, Agentid	

The above may be usefully compared with the essuits obtained from subjects of ordinary forms of depression and exaltation.

We have stated elsewhere that the delayed reaction-time obtained in usual disease may be due to the implication of the sensory and organ, or to the central link betwirt sensory and motor adjustments; and that in alcoholic insunity it was probably the perpheral end organ which suffered. We must not, however, lose eight of the notable enfectblement of attention so largely betwayed in the mental operations of alcoholic subjects. Even in around subjects we have noted a wellmarked increase in reaction-time after alcohol, although the subjects operated upon thought their reaction was quickered—a result in complete accord with Exner's observations where the reaction time was reduced by this agency from 19 of a second to 19 of a second.* The effect of a diminished attention due to the distraction of a too sepid process is here probably the chief agency at facility we must make due allowance for this failure in chronic alcoholism.

RESCRICT TORK IN DEPRESSURY AND EXAMPLES.

					Acception Statement	Optic Handel
J. H. B.; -	Souph melenchales,	2 L		_	13	20
C.K.	Hyperhandrood in	desirable	4.		116	94
C. P	Delamani	-			118	'21
N. K.	Chrese	-			 -24	-18
K. H	Singer				:28	518
R. 18		-	-	-	 -21	-98
J.M.	Hypochontraces	8			- 11	90

^{*} Bermann's Bandt, et. Physics., vol. it.; Lebbl. sp. col., p. 480.

REACTOR-TIME IN DEPENDENCE AND EXCUREDES - Continued

							Armshir Relegion	Timelin.
A. H	Hypothemirianal	mineral.	ia.			-	-21	-27
J. Bec.	Simply	111	1			- 0	137	127
O. Har -	44	(77)	-			-	-19	-94
0. P.	Chemic				4		-97	47
J. Win	Hypiekmbrismi	1440	4				-25	123
T. E	Chronic	16-1	- 1				-26	27
R. W.	Simple	100			- 0	- 1	-29	(30)
8. W	Chiminterie	77	- 11			-	-20	29
W. Tier .	Acade memor,		-		- 1	- 1	:17	24
W. Win	W 11 1 - 1 -	9.0	- 1	-			-17	2.0
W. H.	Simple andisente me	stary .	- 1				38	23
M. B.,	10 11		- 1	-		- 1	99	125
W. M.C.,	Acres mening .	- 4		-		- 2	- 54	-22

Increase of the specific resistance in the motor nerve-trunks may possibly explain the tremor, but that it is largely due to defective innervation of nerve-centres discharging along those tracts is highly probable, both elements taking part in the morbid state; for, even if the former (that is, the specific resistance) be not directly exquested, it is relatively so increased by a fall in the energy of the centre. A continuous contraction is thereby rendered impossible from want of a sufficiently rapid discharge from the nervo-centre; such nerve-shocks are not given off sufficiently quick; and the resulting contractions so not fine into one tonic contraction, as in a healthy physiological state. That a pathological change occurs in the motor nerve-trunks is also. indicated by the occurrence of muscular tentchings, indicative of an irritative process of the nerve-fibres afferting the motor end-plates, and terminating later on in a more or less pronounced parests of certain mmeular groups, which are then overbalanced by their antagonistic series, producing the asymmetric muscular modelling of the face already alligded to.

Afracator apassar and crossps are another frequent accompanises of sheosic alcoholism of the nerve-centres. They chiefly seem at night, and especially when waking from sleep. Their severity is great; the saucles of the apper and lower extramities chiefly suffer, and the resultant pain and contraction is often attributed by the subjects to the influence of their unseen fees. They speak of their wrists being wrenshed round, their arms twisted and deformed and their logs subjected to fugletful terture, and they complain of aching pains and feelings of fatigue in the limits for prolonged periods. Such cramps novar late into the history of the alcoholic, and are often at night associated with frightful dresses, when plantanes are often woren into the delazional web constituting his mental life.

The oculo motor apparatus is by no means so frequently involved

as in the silied affection—general paralysis. The popils are often dilated and aloggish in reaction, they are selfom anequal is size, and the most advanced cases show often no impairment in the reflex adjustments apart from indications of a localised afferests.

Natiogens (as the result of cerebro-spinal sclerosis) is of somewhat frequent occurrence in chronic alcoholics. Thus, as J. W., continuous movement of the cyclesis occurred in a bornrousi plane.

Epilephform Attacks.-A highly characteristic group of symptoms inaugurates a later stage of alcoholism. The patient is suddenly seized with fairtness, troublings in the limbs, extreme paller, and breathlesaness; vomiting may supervene; and then slight twitching may or may not extend to a convulsive starting of a whole limb (or one side of the body), or become generally spread over all the limbs, but rarely with complete loss of constituences. It has been conclusively shown that as regards the criminal, at least, epileper is a most frequent sequel in the offspring of paternal alcoholism. "In connection with this point, and also as showing the great tendency of alcoholism to produce early convulsions in the offering, it may be mentioned that the average age for the commencement of the fits, for those spaleptics who have a direct heroditary history of drink, is less by 4th years than for those whose parents are returned as soher, " Upon recovery a monoplegia or hemiplegia may be found to exist, and aphasic continous are by no means infrequent. At times symptoms emissions of such attacks present themselves, but do not issue in convulsien or paralysis; a slight diminess or actual vertigo, accompanded by erroupal attacks, or a more tendency to faint, may be moned; or there may be paller of face, associated with sold perspiration, while the patient sinks exhanged into a chair, but may rapidly recover, complaining only of numbross or tingling in arm or leg. The sudden onset of unlinteral twitching in the face, followed by slight paralysis of that side, is of frequent occurrence in such cases; and slight "strokes" of our side of the face, or of a limb (that is, slight in viscore of implication), and of very frameion; duration, is a prevailing symptom which secure over and over again in this affection.

T. P., aged sixty-two, walcover, a shownsker by ionle, a man of molecule beight, well-normhed, but both at tenter with marry grey have around the boul; the right papil occurshed the larger of the two both action is their reaction; the tanger protocoled straight, is tremadous, superficial arteries hard, contest, tertains, intemperation. There is no history of inherited instinity. For samy years he has been a drunken, northfees character, but has not before suffered from invaring; for twelve years past his drinking habits had become most excessive, and it was apparent to all that his memory was implicabled, his married powers were becoming antention, and his behaviour children. These

^{*} Henry Clarke, MaD., eye pit., p. 200.

months prior to his administra at the arglam, he was taken to the Union Workshouse, where he developed more action symptoms, was restine at night, developed vague fours, could not along, "became some one might kill kim." Armil halforestations became now apparent, and a voice distinctly entered him to take his own life. Then it became evident that he was the origins of convolute sciences a be decided ever having had a paralytic stroke. He was attentive in his habits, not destructive, and not colour.

The meraing enceeding his administrate was rection, continual, hunting into tears whenever interrogated; there was protound dismentia. He was quite obtained to his recent hadory, and did not know whether he had been days, mortile, or years at the neyless; in fact, all his notions respecting time were posity. He commany failed to retain over for a low moments what he was bold. He articulation was think, thereof, and at times on indistinct as to be whelly unintelligible. In general appearance he was demically action.

Shortly after administra, he had one alight epileptoid seture, and, with this exception, he had no further convenient setures for some months, when a succession of eight the occurred one monthig backing him exceedingly torpid and sub-conscious. From this state he railled softenedly to got about again; but was weak and tothering is his got, and frequently staggment backwards. His demonstra was more presonance—his was very quarreleous. One montag, shortly after this, he was beind with sovere convenience, occurring about without intermines in the right limbs, aids at face and body, and slightly in the left leg. Therry grants of chloral, given per rectam twice in half an hear, cannot arrest of the convenience. Next recently affected. During the suscending three or four months, he had because recently affected. During the suscending three or four months, he had because to recovere of such convenience, with precisely the same manufactivities us in the former attack, and chloral in all more impolly arrested the convenience. About three years after admission in such in a condition of stoper, bullewing convenience months of the same manufactured convenience.

(Sectio Codes,) Shall-sup-symmetrical, becautionly the merculand very policy slight adhesions of the first make. In frontal partetal lobes of lyain there is considerable waiting, most murbed in the left homosphere, and pendiadly so in the morning parietal correlation and the boundaries of the Sylvius finance; both homospheres, however, how suffered much from this atrophic process. The great equals at the base are all extremely atheromatous. The brain is pale as a whole, and its consistence amounts reduced; the membranes are thickened, relevations, and readily strap; the section of the brain shows much pather of the cortex, which is actually diminished in depth in the regime already referred to as wasted; the white substance is from idea much, but embraidly diminished in balk, and succombal upon by greatly difficied lateral contribute, which contain 9 minors of field. A very small patch of howes indication was bound, implicating the posterior perties of the right corpus structure. The gaught elevatore and the combellum presented nothing about mid. Whole brain weight 1,224 government

Heart and longs present nothing unusual beyond hypostatic sugargement of the latter. Lover weight 1,365 grass; in eitherent to displanage by beigh adherious of the capsade; its substance is their pigmented, and very firm; in the right lobe term its appear matter to a large eyet with a distance, white, tough capsale, and commanding about their first. Sphere, 45 green; also firmly achievent to atomach; its

sobstance congested, soft and dark. Hight hidney, 163 grass, capsule thus, etripe from a smooth, pule surface, revealing numerous shallow mans; both certical and modellary partiess are mack resisced—the peirrs tilated and full of six; the organ generally is pule and modelly flacess. Left hidney, 120 grass. Structure reduced to a narrow strip § such in diameter by a longe hydro mykrosis—the peirrs being energously differed.

It must be obvious from the foregoing considerations that any division of chronic alcoholism into separate clinical groups must be a purely arbitrary measure, justified only on the grounds of convenience in clinical teaching, and in the study of the wide-spread meanderings of the diseased process; that, with greater or less psychical disturbance, either sensorial or motorial anomalies may preponderate; and that the most notable fact is the tendency to a serious degenerative process, first (but not necessarily so) implicating sensory areas, and then transferred to motor realms of the brain, implicating in its course the moral and intellectual facalties. Hum divided his cases of chronic alcoholism into six forms:—

t. The Prodressal.

2. Paralytic or Paretic.

3. Amesthetic.

a Hyperestletic.

5. The Corrubine

6. Epflegeic.

Magnan, whilst justly criticising this division as not a genuine clinical group, specially calls attention to one form—the hemiansutbotic type—which, from clinical and pathological considerations, he deems worthy of this dignity.

J. U., aged sixty, a widower, employed at his trade as carries up to a weak preceding his admission, although his inertial enfolklement must hive host of some duration, praigner from his state at that time. It would appear that a women, with whom he consisted after his wide's death, had convealed his pointal attentions action, with the object of positing by the entrange. A manifold attention the Union authorities, who found him incoherent and wildly emitted. He was said to have lived a temperate life; to have had no convolute, strake, or crunal injury; and to have exhibited failure of several cody quate recently. All those statements, however, were covered with reserve, enting to the relationship waiting and affailed to above. The manifold attack may possibly have been the seguel to a convolute source unperceived, be this as it may, the following Officer found him noisy, incommitty talking in an involution was moving his form; we had along but little for reachly a week.

He was a short, thick set individual, 5 feet 3 meles high, and weighing over 10 stones; of flowd complicator, with diluted make capillation; hald at vertex, with grey towars. His becometer system appeared maffected, and his grasping power was good; his special betrayed to defect. His body generally was obest, but there was no destired evidence of cardiac degeneration upon association, owwere the superioral vessels notably hard or cooled. His montal state was that of magnetical cooling notably hard or cooled. His montal state was that of migracal configurate; he was girealous, still in the attenuess, and always irrelevant. His memory for constance events was good, but for recent events it was wholly at lauth; he was untenly improvementere of the nature of his sur-

resultings and present condition; attention could only be nonmanised with extreme difficulty, ewing to his marking off into disconnected attenues. His mood, although variable, was usually cheerful and lively; no definion was expressed, and no halloclassions were apparent.

For a week following his admission, he was given four-dracker-down of surgan confi three times daily; the physiological effect of the drug was freely indused. but his excitement did not encount to its influence; and as he was weak and concerns exhausted, the drug was discontinued. The excitement persisted for two months, during which he lost weight and booked very ill; but, upon its abutement about this time, he again began to gain in weight, betinying, however, a very notable degree of dementia. No further maximal carthurst occurred, and he was relegated to the class of indelest, harmless, and helpless patients. A largeha mations, sarts now developed—it, was believed as the result of a full on the floor. Eighteen months after admission, he appears to have had a paraletic sensore affecting both limbs on the left side, or which measure amounts was somewhat blooded and the superious refleces were impaired. He remained torpid and heavy for a few days, and was then allowed to get up; he was very leable in limb, and the left by dauged dightly during progression. The entring two months was marked by rapid advance of physical and mercal postration, due to programme atrophy of the brain; his mental decelites were now almost wholly abelished; nor could be stand up, although he was able to move his bands and arms fronly, and with some degree of force; if placed in the erect position, vales supported, he weeks double up at once. The tongue is protruded to the left, and is tremshow At this period he was subject to threatening attacks of passive congestion of the lange, due to failing cardiar energy.

Two years after administra, he was completely hedrithden, quite helplans, and imapable of charging his position; a bedoore breased over each great irreferator; his large were competed at their hand, but his pulse was fair, and his appetite good, much final nearistanent being taken; he was utterly futness in sepect, and mindless. Cardina energy, however, open which so much depends in the survival of these chronic invalids, at hist became rapidly enhanted; the large became greatly engaged, and he died oversion two years sed four months after adminion to the anylum.

It has already been shown by our remarks on the evolution of the psychical symptoms, that the invasion of the cerebram by this agency often follows a very definite course; and it is only in the later stages, when the wide-special selectoic shanges in the nerve centres and the degenerative vaccular lesion are most apparent, that we may get that protests aspect from a multiplicity and complexity of symptoms, which led Magnan to state that "we do not know, in fact, what symptom there is which might not be associated with chronic alcoholism under one or other of these conditions." Such actitions symptomatology, however, does not pertain to the entirer stage of the affection, and we then cannot fail to note the tendency to a restriction of the sacre processional symptoms to one or the other sphere of cerebration. Thus it is often noted that the symptoms are almost exclusively senserial, hallocimations being a most pronounced lesture, whilst

tittle or ne genuine intellectual disturbance is recognised or but trivial motor ailment; other cases present themselves where the ailment, from the outset, has been a failure in the sphere of the intellect, with little or no semorial or motorial implication; and lastly, there are those cases where the full action of alcohol appears to have been expended upon the motor sphere of the brain after a very abort term of semerial disorder. Yet, the symptoms of implication of special carelral territories too often devotail and overlap for any trustworthy clinical classification to be adopted; and still more frequently, if the limitary be one of progressive invasion of one territory after another. The more characteristic forms, however, under which covolval alcoholson presents itself to our notice to asylune for the issues, are the fellowing:—

- Purely sensorial type—(a) common sensibility; (b) visceral;
 (c) special.
 - 2 Primary annesic forms.
 - 3. Premature sending, especially implicating motor areas of cortex.
- 4. Deluzional forms with vascular lesions in basal ganglia and medullated tracts of the cerebrum.
 - 5. Motorial types.

INSANITY AT THE PERIODS OF PUBERTY AND ADOLESCENCE.

Gententa — Evolution of Palacety and Adolescence—Palaceters in Distinguished from Adolescence — Antagonism of Growth and Development — Excessive Metabolism of Editory—Acquisitiveness and Mimetic Characters of Child ood — Instative Tendeness of Adolescence—Palacett Instaty in the Franke-Delorence and Hallocomicions Relayers of Membrani Periods (Byderic Type of Maria—Stoper Coincident with Membrani Demograms)—Care of F. W.—The Elood in Stapeness States—Class of M. A. H.—Dindogy—Acceptual Influence—Periods of Succeptuality—Statistics of Hereditary Factors—Grazian Demograms and Palacett Instative (A. H.)—Acceptual and Acceptual States—Influence of the Environmental Factors—Percentury of Hamoglobin to Cases of Simper—Palacett Instative—Periods of Hamoglobin to Cases of Simper—Palacett Instative—Male — Sexual Exerquisis—Symptoms of Pubencent Instative—Modeled Forms (2. M.—Mailerbatic and Uncomplicated Forms of Palacette Instative—Environmental Model Imbertic

The Physiological and Psychological Evolution of Puberty and Adolescence.—Of all phases of human life, physiology deals with none more instructive than that of its critical periods. During the first and second destition necessitated by altered conditions of life; during puberty and adolescence, when the procreative faculties are being unfolded; during the decay and obsolescence of these faculties at the menopause and grand climacteric; and lastly, during the final retrogression of senting—the physiological changes are fraught with protoured interest, and in no less a degree do serious departures from normal functional activities prove suggestive to the yathological enquires. The period of paherty, if we neglect those variations due to climatic and social influences, is smally fixed between the ages of thirteen and fifteen for females, and of fourteen and sixteen for males. It is emphasised by certain well-marked external signs, such as the prominence and elemention of the larynx, and lengthening of the vocal shords in the male, with a corresponding lowering of the voice an octave or more; an increased compans of voice in the female; the appearance of hair on the pubus, in the axilla, and on the face in the male; the widening of the hipe in the Sonale, and the greater vascularity of the external genitalia; an calsegement and greater activity of the schaceous glands. These superficial evidences accompany the development of the internal genital organs, the maturation of the Granfan follows, and the mensirual flux; whilst the galactophorous ducts of the mamme proliferate, and true acini appear.

The gentral organs are usually mature at this speck, as far as their directors and functional activity are concerned; therefore, we may regard sequentiation (which is conclusive evidence of guberty) as significant of the arrival of sequely residently. But it is well-established that sexual maturity—that is, the capacity for boaring children—need not monomically existing with puberty, for some girls are mature before mentionalise has conserved. If we have recourse to Dr. White-boar's statistics, " we find that the larger proportion of same of first expectangular secural the age of sixteen, and that nearly 60 per tent, of the four thousand cases of general recorded by him, occurred between the upon of fourteen and sixteen years. I have appended to his Table the percentages for each year:—

42	age of	10	Street,		first manuscratted ;	HAP	econtage of	0.995
	10	11	100	25	iii			D185
		12	11	136	atr.			2:40
	11	18		202				5:20
	41	14		638	911			1-95
	11	15	m	244	- 0			0.00
	-	16		507				1-12
	n.	12	11	420				2:47
	10	15	11	233	-			9 52
		15	44	148				3:45
			-	71				1:77
		20.00	100	9	4			0.225
		22		. 6				015
	-	20	0	0 2				FOA.
		24		1				0.025
			75					
		45	100	13	11			91025
	12	26	31	12				0.005

These Tables indicate that we may eatily confinde all cases of instanty under the age of thirteen years, as not coming under the category of what we are about to consider—vin., instanty occurring in the male and female on the attainment of

^{*} Shorilly and Aboroin, p. 46.

sexual materity, and through the period of advice-core. The small percentage of 24 who show themselves exactly maters at the age of twelve, may be safely left out of consideration, more especially since cases of immity eccurring at this early age and up to fifteen are comparatively very encounters. The term "sexual enterity" is liable to minimal; we must clearly understand by x—provention materity, and enthing more, since it by to means refers to full sexual divergence, in which the whole frame work of the body participates, and in which the central nervous system also undergoes a protound change.

The period of adolescence, however, may be regarded as extending from pulcety to the age of twenty-one in females, and twenty-five in males; and is characterised by most profound changes—especially by the completed development of the osseous system (Power and Sofywick)

Puberty involves changes of vast moment to the subsequent stage of manhood. Anomalous conditions are but too frequently established at this spech, which lay the foundation for future physical and mental disability. Growth is actively proceeding, and the osseom and noncellar systems are adding largely to their bulk, so as to vastly increase the force and range of their artivities; but with this notice growth, differentiation and subordination of parts proceed until maturity is reached, and adolescence issues to full sexual divergence. It is a well-recognised fact that full sexual divergence is not, as a rule, ensured until the framework and its musculature are approaching muturity (Carpenter); and in fact, the extreme differentiation requisite for this divergence of sexual characters appears ultimately to demand a counties of that enapproise satritive activity which prevails in the earlier periods of adolescence.* The establishment of an equilibrium in the metabolism is but one illustration of the great law of "antagonism between growth and development, which is intimately connected with the law of reproduction " (G. H. Leccut). Timps metabolism, therefore, is by no means a constant for different periods of life. The epoch we are considering is unhered in by greatly augmented activity of the nutritive functions, and affects a parallel to the conditions existing in earliest infancy and childhood.

Thus, an infant is known to troble its weight within the first year of its live (Landon and Schröber); and from Quetelet's researches it is seen that the first there years (and especially the first year) are

^{*}Than Spengelberg affirms that. "So long as the body has to provide for the own development, and consequently requires a large amount of formative material, it has no energy to spare for propagating the species. Till development has countd, the organs which serve for that purpose remain masters and small, and most of the important distinctions between the two serves are about." [Taxi-book of Midnighop, New Syst. Soc., vol. 1, p. 50.)

^{*} Tide of Worths p. 255.

periods of wondrously active growth, the increase in stature being as follows:-

First year, a growth of 20 cominguities.

Second ... 10 ...

Third ... I ...

Fifth to notempt year, ... 51 ... per annua.,

Towarty fifth to thirtieth year, ... Full status attained.

As Tronsseen states—the supplity of growth during the first three years would, if not checked, result in a gigantic stature, but, "from the beginning of the fourth year, growth proceeds more slowly up to the age of puberty, when it takes a freed start." As at this infantile period (when the metabolism is so extremely active), every presention. is demanded to maintain the nutritive replacement of such tissuechange both in due quantity and quality, so also during puberty and adolescence, too much care cannot possibly be lavished in providing for the wants of the system-for it is at this epoch, beyond every other, that the physical and mental characteristics of the man or woman are permanently moulded or stereotyped. A parallel has been drawn by Trousseau betwixt this period of setive infantile growth and the subsequent stage of wholescence, wherein he recognises analogies in morbid states at these respective epochs-the estacunlacia of adults he thus places parallel to the rickets of infancy. Excusive expenditure of nutritive forces occurs with especial frequency at the period of puberty—the lad in usual parlance is said to be "outgrowing his strength;" he may add 5 or 6 inches to his stature in a single year (Trousseau). As Dr. Edward Smith also states it :- "The period of puberty is associated with two classes of evils, viz., excessive development of the cerebro-spinal axis, and defective growth of the organs of organic life. + Such greatly-augmented metabolism taxes to the atmost the constitutional powers; the requirements of the very captain increasing mesodermal tissues are imperative and urgest; circulating albumen is rapidly extracted by the growing timpes; asthat, unless a more generous diet to given, whereby such lass may be replaced, serious impoverishment must enoue. Functional disturbances as a consequence occur, whilst mai assimilation furthers still more the vicious progress, and lays the functation for nutritional adments, such as interels, to which this epoch is so prose.

The excitometer irritability of infancy with its jerky, spannedic, ill-directed normaeuts, wanting in object, wanting in power, co-ordination and skill, pass, in the growing youth, under the control of higher centres now evalving. Action is now directed to a definite purpose, and muscular activity becomes, in one form or another, the suprempleasure of the regarden; yet, such activity is still chiefly testa-

^{* (}Washel Medicine, Syd. Soc., vol. v., p. 82 | 1 Optical Changes, p. 286.

tive, imitative, and weating in indications of prescience and in thaccomplishment of elaborate or far-reaching results. Enjoyment appears to be the purport of this vigorous and active stage of life; restless movement seems to be necessary for the expenditure of superabundant energy; and mental acquisitiveness lays up its store of facts for fature are and application. The growing lad mission the man-

A welding or a betteral,
A mourning or a fareral,
And that now hith hit heart,
And unto this to fraces his song;
Then will be in ion torque
To stadegues of bianteen, hove, or stride,
But it will not be long
The this to thrown units,
And with now joy and pride,
The little actor cons medien part;

As if his whole vocation, Were undiess instation."—Proviscosti.

With the advent of pulcety and adulescence all this is changed , the rapid growth of the organism is now accompanied by rapid transforms. tions of the nervous centres, and as the parts chiefly affected are the bony framework, blood-vascular tinutes, and the museulature, so should we expect a greater or less thunds in the molecular transmittations occurring at the centric expansions of the motor system of nerves; hence, the higher co-ordinating centres - the psycho-motor area - must undergo important developmental changes. Correlatively, there dawns upon the mind the consciousness of fresh motorial capabilities—the overflowing masent energies are directed into new channels of activity, rendering new tracts of corebral tissue personable; and fresh motor combinations arise. An undue estimate of the subject's especities usually exists; the imitativeness of youth declines before the selfcommune and originating tendencies of the adolescent. Then there crowd in upon the sensorium the impressions aroused by the slowly-developing generative organs, and the rague indefinite notions of sexual relationships gradually take form in the definite divergence of mature age; life begins to assume a reality which it formerly wanted. The mental characteristics are peculiarly of a constructive kind; and the issue may be favourable or victors, according to the eduration and training then received. In some, the emotional element will be favoured, and reverse indeleged in to a vicious extent may paraluse more useful and rational activities. In others, the imaginative faculties may be chiefly stimulated; the lave sick lad will pour out his plaint in seese; while girls, especially, are prene at this period to reverie and "contlo-building." For the fostering of such vapid states

in this class of subjects, the semanticual novel of modern days appears specially designed. In the female we find the aniable rictues especially aroused, whilst in the male the dormant moter potentialities express themselves in the form of extravagant, half-developed, ill-digested plans, overweening self-entoon, and an egoism at once obtrasive and objectionable.

In the Female Subject.

Symptoms.-The immaty peculiar to this epoch is essentially an neute neurosis, not that the intensity of the symptoms is so great. as that exaltation and excitement, the symptoms of an acute cereteral process, prevail. Other forms of insunity (notably that incident to the early prosperal period) exhibit for greater infensity of excitement, yet asute mania premile; and, although extremely rare, even neute delirious matrix has appeared. This predominance of matrixeal states over states of depression is also a feature in the insanity of the presperal; but it is even more prevalent in the form occurring in adolescent females. Here, however, we note the infinence of sex in modifying the type of the nervous process. Maniacal symptoms likewise predominate over depression in the male; but their frequency, and intensity are notably less than in the other sox, so that the arevalence of molanolofic more with degreening defusions becomes in this sex a far more obvious feature. This we attribute partly to victors habits, which also to a semiderable extent influence surprogressis. With this surotional perturbation we find associated much intellectual derangement; delusions of a definite form betray themselves at an early period of the affection; and, as we shall see later on, are, in the maniscal forms, highly characteristic. The melancholic perversions usually embrace ideas of persecution or impending trouble; notions which commonly assume the form of beliefs that the food was poisoned by relatives or friends. From a study of agel intellectual and sensorial perversions, we find that delusions recentled in one-half the cases of both sexes alike; whilst about onesourth of either sex were subject to hallucinations of the special senses, the visual and aural halloconation, esparately or combined. being for the more frequent." As many as 16 per cent, of the deludes cases entertained ideas of poisoning. Religious delesions existed in a few cases, but for more frequently and their imagined troubles affect their social or domestic well-being, such as the following: "Bobber of all for yourmine; her have in flames; wother dear and have rained; has murdered some one and is personal by policemen; in to be bornt alive; men concentral in her transleade; fellow-parients try to

^{*} Or in he paint—delutions were present in \$3 per cent, makes, and 49'3 per cent, females ; halloconstices prevented in \$3 per cent, of either cer.

of this class. In most cases of this form of mental decangement, business accurate be the symptoms, it will be found that excitement abases usually at an early period, even within a few days or a week of administration to asylum case. The removal from prejudicial home influences, the regular administration of good autritions diet, and the ensurance of a due amount of sleep, case short the attack very rapidly. Yet this is not permanent; one or more relapses are almost certain to occur ere convalencence is finally established. All such rapid transitions from mental turnooil to calm are to be regarded with suspicion; but more especially here, where the mental decangement is itself the expression of a process closely related to the cycle of event-outerine excitation. At each monthly period the mental molumes will be associated with greater or less cerebral excitation; hence at these periods relapses are apt to occur (M. C. W., p. 242).

When there is decided catamonial progularity or suppression, when the assemble of puberty exists, we may with confidence anticipate a relapse; nor will the more general improvement in health ensure perfect recovery in the majority of cases, until the assemble is so far removed as an issue in the re-establishment of this function. Not that the return of the measure cares the instainty, but that the natural advent of this flux indicates a state of healthy function generally, and a condition of the circulating fluid which brings up the natrition of the cerebrum to its wonted vigour. Dr. Closston has noted this tendency to relapse in the invanity of adolescence.

"This bearing to short, sharp attacks, with interminance of nous perfect easity than occurs in most other kinds of mental disease, with religious occurring one, two, there, four, and fire times, and even news frequently, before recovery or demostic finally takes place, may be taken to be reportedly characteristic of this immaity of adolescence."

The excitement in the less intense forms is peculiarly associated with hysteric symptoms; the subjects are, withil, often shrewd, calculating, watchful of the effect produced on the bystanders, artful, and cunning, they will sham epileptic fits or other allments. They are often wanton, exhibit much absorber, are erotic in gestore, conduct, and speech, and obscently of remark is by no means infrequent. One patient at less home, regarded as abbrican to all that her medical attendants were sking for her, enumerated afterwards every remedy tried, mentioning the dose she had beard the doctor order, and repeating his diagnosis which she had beard the doctor order, and repeating his diagnosis which she had been overheard. Others will show much hystoric sobbing or laughter, or, amounting a children, pettish tone, will become querilous or wildly passionate. The retrievoys of nature of the delession after thamps this hysteric temperament. Thus such sub-

jects will declare that they are mangled, out into small pieces, are to be builed alive or crucified, yet exhibit no corresponding terror. Again we often and indecent conduct and creatic tendencies associated with conditions of religious century, and bointerous, marely demonstratureness alternate with states of great stupor.

F. W .. aged twenty, a morried woman, had been decanged for a short period when wrenteen years of age, but received at home. She was tall, of fair conplexion, muscalar, but extremely pale and anomic. Highly servous and emitable. Regarded as of unstable meetal equilibrium, a nearetic intentance was naturally suspected, but upon close enquiry no clus was obtainable to such. Her former attack (surra) had been entributed to a lover's quarter. About three tecephic before admission to the asylars; she had shown a strangeness of behaviour not. customery with her; had become explose of her household dation, includent, negligout of her hashand's requirements, reticent and avoiding contact with her relatives, passing her mother and others willout speaking to them. She then, without any expression of definite delasion, betrayed strong jorkency of her hashand, was watchful and suspicious of his accounting possed centless nights. trok food scartily, her health becoming more and more impaired. Subles not berets of excitement supervised; she was violent and when theuried, would by to escape by the window. During the whole of this time she suffered much from beadacter, and had what were described to fainting fits upon several occusious, Under medical examination for condition was that of acrite musia, a stronglymarked bysteric element being amortated therewith. She establised upon the has said show in spileptic St, talking investedly much incoherent non-case; no rational reply could be obtained from him. Later, she exhibited a tendency to laterspores religious phrasos and quantitations, with atterance of an arotic and obscure nature; her dementour monorials varying from that of a fixed codary to combice betraying strongly-marked create features, houseness lengther, or counten weeping alternating with violent passion and destructive tendences. The respiratory and eleculatory systems were normal; but, as before stand, therewas extreme assemin, which accounted for the persistent amenorthes from which also unferred.

The tendency to stupor is especially marked in those cases where there is well-pronounced menstrual derangement, and its alternation with hysteric excitement is a frequent and interesting feature in the insanity of puberty.* In the stage of stupor complete spathy prevails, amounting at times to fataity; the expression is stopid and

*In such autanoos of super associated with measureal decongruents, changes of undoubted moment occur on the communities of the blood. The red corposed or selden disturbable in reacher to any notable extent, but their homoglobus is in all cases alike reduced in reacher to any notable extent, but their homoglobus is in all cases alike reduced in associate. In cases we find the corposation value below half the normal, as in the case of C. W. (p. 286), where it is represented at 43, or that of R. W. J. at 44. The amount of homoglobus, as given by the inversal cases at page 286, the tractes between 40 per cent, and 50 per cent. Even in the most profound steper of W. S. associated with labels of matterbation (see p. 286), the percentage of homoglobus never left below 48; rec in any case of simple anomality stated stappeness remarkly have we seen the colouring matter reduced to the extreme limits seen in cases of functorrhage. Thus, in the case of M. A. M., the homoglobus registered as low as 20 per cent.

don-sated; the pupils widely diluted; unlive dribbins from the month; none of the wants of the system are attended to; the hands long belighestly, and both extremities are cold and livid. The subject is usually professelly assume, a homic truit may be board over the arette valves, to the femitale-fields over the subclaviar. Such symptotal are almost invariably associated with suppressed menon, and frequently the vicious habit of maximisation prevails. Stoper, however, it not a necessary accompaniment of these memoraal derangements with pronounced vaso-motor troubles. Subjects present themtrives suffering from emperation of estamenia, with exemine livinity and coldness of the hands, who are not stuporous, but excited, flappant. and erotic. The wast-motor centres for the limbs are in jurisposition to the cortical motor centres of the extremities, according to Eulenberg and Landsis, their fibres passing apparently through the posterior limb of the internal capanio, and it is therefore to this site we must assign most probably the irritation resulting in the coldness and lividity seen in the limbs of these subjects.

M. A. H., aged miselees, single, a young girl of delivate physique, very thin and reduced, puls and extendingly seamer, referring from her first attack of immerity of about seven days' duration. She subseited a rescribe tendency from the father's side; the great-grandmether was a paralytic; the father was insure; and the daughter was described as being of high-strong nervous temporament. She had been intelligent, and had taken an active interest in her lather's business. (more mattle); his late illness was requeled as the emiting cause of her attack. The patient had always suffered from catamental tregularities, and the measure were now completely suppressed. Bestlemens and mounts were followed by hallin taxtimas of the special senses and delensors. When brought to the anylone, her bloodless deport was very notable, and her physical prostration great; she stared recently around, quite image-intive of her position and relationships, someonally uttered a few articulate words or disconversed meaningless sentences. and did not reply to any question asked. Her hands were should first and lived; in fact, the previous excrement had layed, and a consisting of staper exacted; the outleter had to be regularly used before for admission. Part wite, milk and eggs, with extract of heef, were given freely. Assumatio-citrate of iron splered twice daily and 30 grains of chloud a lies required at might inflient, however, was required but solden, as she note obtained sleep without its aid) During the whole of the succeeding murth, patient's state was one of assesse. mouth Nepor and apathy; she results sat to a half-best posture, eitherly skivesty. and negligent in her habits; saliva distilling from her mouth; her expression mount, fitnesses the pupils were diluted and diaggish : the extremities him and rold; volitional effort was rare, and compulsory feeding had to be communously reserved to. Occusionally she swayed to and fro, and gave atterance to a prices whiring or a mountagless habiling. This condition of sorts descentiscontinued for twelve months. Her bodily health then slowly but progressively improved, and during two succeeding mortlin the regained flesh at the rate of 10 The per mouth, mental traper, however, still continued, and personnent autonorrhon. was associated theorytics. With this progression physical improvement there now appeared a gradual advance to more normal states of consciences; but not until

servators months and clayerd (ii) she began to speak rationally, and about this time the outneereds appeared. She became bright and Bruly, but still betrayed many morbid proposation, and was mischievess, unruly, and emitable. Her progress to perfect satisfy was interrupted by a about relapse; but her recovery was emitted two years after her admission.

Impulsive as these forms of insanity appear, our records show few of those desperate attempts at self-nestruction, which characterise some other forms of insanity. The actual percentage of cases returned as tuicidal is high (40 per cent.), whilst in male adolescents it falls to 25 per cent. This might lead one to infer that the cases were nigh as saicidal as in the form of imagity prevailing at the climacteric, when such impulses are strongly developed. This, however, is not the case. Hystorical forms of mania are prone to suggest or threaten such acts, but all such attempts are usually forgaed and prompted by the morbid desire to create sympathy or produce effect. We must, therefore, not be misled by the fact that these cases have committed outrapeous acts which seem to imply a spindal tendency, or have frequently threatened to destroy themselves. They are not in the numberity of cases suicidal in the sense that the subjects of puerporal and climaeteric mania are spicifial. On the other hand, they are far more likely to turn their destructive efforts against others, and our statistics emphasise this aggressive, dangerous tendency in 18 per cent. of the female, and 55% per cent, of the male impates.

Etiology.-The excito-noter exaltation of the nervous system, during the first dentition, has also its parallel in the explosive condition of the nervous centres in higher planes of cerebral activity. during the evolution of the generative functions, and the sexual divergence of the epoch of early adolescence. Hence, this period is the second great trial of the constitutional powers of the subject, and is especially prone to reveal any direcent inherited vices, and call them into full activity, either as convulsive affections of the motory apparatus, such as chorea or epilepsy, or as psychical anomalies, especially of an hysterio type. We shall see further on, that the type of lesanity which prevails at this period of life is essentially that of an hysterical form. We have allosed to the rhythm of putrition, that mysterious law which dominates the evolution of all organic forms, vegetable and unimal alike, as exemplified in the hightide of infantile growth; the ebb of growing youth; the renewed flow at pulserty and mislescence; and the final arrest as the maturity of manhood. Along this curve of simple regotative growth appear the ruleations of ancestral influence. Those species of new developments, or the points when differentiations occur, fitting the organism for new or altered conditions of life; the ancestral energy, so to speak, adapting the organism to its altered environment-destition. pulserty, adolescence, are such species. They are characterised especially by the tendency to reproduce ancestral developments—whether normal and physiological, or only deviations from the laws of health—the new character appearing at corresponding periods of life in parent and offspring. Yet it must be beened in wind that ancestral vices do not necessarily reappear in the afforming at the same period of life as they appeared in the amountor, and that then, "the transmitted characters much offsesor appear before, than after, the corresponding age "(Darwin)." This law of inheritance has a direct bearing upon the intume beritage of advisorements, since, in them, it appears that with special frequency, we find the corresponding time developed into in the life of the parent, and to be frequently an illustration of stavium. If we recall Darwin's remarks on the distinction between transmission and development of characters, we may also more readily comprehend such pathological atavities.

A remarkable persistence of any developmental vices at these periods of active life also exhibits itself, whether inherited or acquired, with which it is well to be acquisinted.

In this connection, it was shown by M. Gossella many youns aroot, in a comminimation to the absolute des Science, that many special expiral effections of adolescents total to person, increase, or relique throughout adolescence, but such tendency to lost at manhood—e.g., ingrowing soil, valges determines, supports tive epiphysal noteins, applying exception, subangual accessor of great toe, and filmess now pluryspeni polypi will usually dely personnel care until the twentyfilth or twenty with your is reached, and temperature, therefore, is often called for until adult age in attained, 7

Then again, it would appear reasonable to presume that all ancestral tendencies which are transmissible, would be pecaliarly potent at those periods when the organism strives to reproduce itself ; and that as orulation occurs there would be concentred bewards certain points, so to speak, the tendency to reproduce similar peculiarities, &c. The nervous system must necessarily sympathise with such conditions, and hence parental vices, and weaknessesintantly, epilopsy, cheren-may be developed with greater frequency at this period of sexual divergence in the adolescent. That the insanity of this period is strongly hereditary, is indicated by the fact that 10 per cent, showed an instane heritage, and that 10% per cent affected a history of ancestral spilepsy; and 93 per cent. of apoplectic seitures. It is this genetic influence which so powerfully manifests itself at this period, and especially towards the end of adolescence, that forms the organised groundwork of the psychosis, and which we regard as the most important feature in the evolution of these forms

^{*} Descent of Man, chap, visit. Turnstion of Automate and Plants under Demonstration, vol. is, 1888.

⁴ See Med. Times and Gat., April, 1872.

of insanity; for, given an organism predisposed by inheritance to insanity, such predisposition will tell with special force at periods of reproduction and development.

A related law has long been recognised, viz., that variations appearing in either sex before sexual divergence is well-established, will probably be equally transmitted to either sex of the progeny; and that variations occurring late in life, when sexual divergence is complete, will be transmitted to the same sex (Devicin).*

Taking the 3,470 cases of insanity in our statistics, we find a clear history of family predisposition to insanity in 290 per cent.—for the women, 310 per cent, and for the men, 272 per cent.; hence, the inheritance by 40 per cent in the adelescent forms in a noteworthy feature. Again, we find the neurotic inheritance generally in far above what is useful to all forms of insanity sinks, as the following instructive Table reveals:—

Cases of Mounity,	Sumirory Insurity.	Purchist Epilogep	Parrytai Apopless.	Patiental Literaperation
3,470 of both sexes, 1,810 females,	29% 31.5	3 68 3 97	3.65	66
1,690 males, 25 adolescent females,	43.0	10.6	91	160

It is, also, a noteworthy fact that the ineanity incident to the scale at this period of life is not (as it is in the female) characterised by a arrough marked herelity, since only 27 per cent. male adolescents affird a history of inherited insanity, against 40 per cent female adolescents; the inherited tendency, then, in the male sex a not above that common to all terms of invanity taken together.

On studying a series of cases of insanity occurring in the female at this period of life, we are at once struck by the pacetry of cases in the earlier, as compared with the later years of puberty and adelescence. This is, of course, what we might have anticipated. The early period is one chiefly occupied with the active growth of the organism as a whole: and is is only towards the later period (when this activity of growth, exhalding, allows the generative organs to develop, and the sexual element to force itself into the mental life—when, too, tracts of cerebral times come to represent the reproductive system in all its relationships), that the developmental tide may insee in a storacy commetion of the nervous centres. This is forcibly illustrated by our statistics. Out of sevenly-seven cases occurring from the age of twelve to twenty-one inclusive, fifty-six (or nearly three-fourths) were from eighteen to twenty-one years of age; three cases only occurred

^{*} Doorset of Man, p. 252.

up to the age of fifteen; whilst nine cases occurred in each of the two following years. The age of mission and firesty was the period of greatest frequency, bence the great prevalence of insanity was clearly shown by these figures to pertain to the years of approaching sexual maturity, coincident with that physiological cycle of mental evolution, which lits the woman for the duties of wife and mother,

Ovarian Derangements.—It is important that we here fully understand the relationship borne by deranged states of the sexual organs to the mental anomalies under consideration. Often is the question asked in cases of insanity, accompanied by amenorsheed states at this period of life.—In the menstrual derangement the origin of the cerebral disturbance, a simple coincidental state, or the result of the nerrous insturbance.) If, however, we regard this period as a great cyclical developmental stage, in which the unfolding of the generative system goes on, puri passes, with its representation throughout the innermost penetralia of the central nervous system, then we must regard the physical and mental expression of this development (the sexual characteristics, bodily and mental, and the menstrual flux) as associated features, as but the obvious signs of what is going or within the polyte and within the cranium.

Menutruation, then, as an evidence of ovarian materation and excatement, and the various secondary sexual characteristics of hairy growth, irritation of the broads, and the modified hodily confernation, must be regarded as phenomena constrong coincident with certain mental transformations in which the girl becomes evolved into full warranhood. By no means out they be considered to be related in variably to each other as raise and effect; nor, moreover, can derangements in the functions of the one organ he spoken of as the chief cause of derangement in the functions of the other. It can be readily universtood that persistent derangement in the menstrual flow must eventually lead (through deprivation of blood) to notritive changes in the nervous system expressed in mental terms; and so also cerebral derangements may modify ar arcest the mentional millioen and flux, through the trophic system of nerves. But the arrest of the menses may be due to inherent developmental defect in the overian gland itself; to a primary vittation of the circulating fluid; to want of trophic energy centrally initiated; or, lastly, to the influence of external agencies gaining access to the economy in some one or other form. The existegy, therefore, may be of very complex unbure; and in summarily dismissing the case as one of mental derangement attributable to amencerhou, we should grisvously err by perhaps taking one indication of a wide-speed developmental arrest of ovaris-aterine evolution as the cause of a mental storm, which in stacif is often but a symptom of associated arrest in the development of the central nervous system.

A. H., aged nineteen, a single girl, occupying the position of housement, and been minimal for four works before coming under our observation. There was a history of a slight transport magazed attack at the ago of secontom, which did not recommisse anythin terratement. She was described as a fairly astelligent girl. of good moral character, and so give to family necessis was elicited. She had exhibited no econstrictly prior to the artack, and had enforce from no serious illness. For a considerable period the manners had been suppressed, and her houlth had greatly fation inc. Her height was \$ ft. \$ ina ; her weight, \$15 fts. The complexion was exceedingly pale and wasy, and the body generally most extangelias in appearance; the viscera generally were healthy, but the lowels had been torpid for some time. At home bey excitement was intense, and she could surpely be restrained from rushing blindly about the house, shoring wildle, whiteling, or reading to a first term, appearing setterly regardless of decemy. She mistack the Herriter of all around her, and did not appear to except the her. parents. Under observation die tentioned incommitte garedon, but fairly referred in special. Her behaviour was flightly, scaling, and supulsive, she sprang out of bed repeatedly, between to imaginary reason, and replied to these; was always to poply to questions, wilful, and overest her face with the bedelethes. Her consciousness was greatly reperced; she latted to recognise the nature of last surpoundings, and evidently ensued the identity of those around for. An alootic parge was ordered, and a drawing diss of the syrup of the prosphate of iron three times shills. Furtamently, her nights were passed in quiet deep, and her appetite was not defective. In Jose than a work there was decided improvement, all arateexcitement had abated, and a little flightness of momen was alone proceptible. She was quiet; composed, quite estimal in speech and conduct; complained manh of occepital healants. From this date her bealth steadily improved a tria fortnight from also soon she was actively at work in the asselle-room; and left the asylam, resovered, three mouths after admission,

It has been already stated that invanity occurs in a rapidly-increasing ratio from the age of fifteen to twenty, the three last years embracing three-fourths of the total number of cases. Of all those cases 57 per cent suffered from menutural derangements—a very high proportion—illustrating the frequent association of these conditions. If, now, we take into consideration the relative female repulation of the county, and even of the district, involved between the ages of 10 to 15, of 15 to 20, and of 20 to 25, we find there is a stoody decrease in numbers. Thus, the last consuscreturing give for the West Riding of Yorkshire, the number of females living at these respective periods, as follows:—

From	10 10	15	yem.	14		10	115.032
10	15	20	14				100,604
10	20 ,-	25					114.473

So, for England and Wales together, the population between the ages 10 to 15 and 20 to 25 has fallen from 1,338,101 to 1,223,672. Between the ages of 13 and 15 we have all the disturbing elements of pulserty and its incident changes; yet, though the numbers living as this age are far greater than at a later period, mountrued deraugements, associated with coretral disturbance, are exceptionally rare, whilst after 18 they become extremely frequent. The somewed table includes those cases

DESCRIPT AT PRIMERY AND ADDRESSED WITH GO-OCCUPANT MEMORIAL DESCRIPT OF NOTATIX ANDRES.

rain.	Apr.	Restroit Codding	Breaks
1	23	Amenderhous for loss mouths.	
Market to to take	38	of late (tack	
1131	265	" for eight months throughout at-	Name and Address
1020	25	- Per wight moethy after admission.	Great mental stapor.
11.00	20	throughout attack.	The same of the sa
0.21	91	_ for any months	Fair holds coulding
11/23	14	turnightet attack-	Stant, approaching obest.
3	35	The state of the s	the death and the
1120	33	for the mouth prior to ministion	Fair bally committee,
20	20	and persestent up to discharge.	BORN BORN - IN TRACE
30	22	_ for six mostly prior to admission, not re-established up to four mostly later.	Pallid, forble; wide, dilated pupils.
TI	18	For five months after schmission.	Very pole and nonthin
H	51	- perintent up to duckage	Control of the Contro
13	29	- "	
10	20	and the same of the same of	
25	23	In fun mostle preceding and three	Papils widely diluted.
56	20	insethe following admission:	
17	20	for neven neutlin after all mission. Jensistent timonglisest attack.	"
13	37		This rollid and selected and
8.7	41	of late, but precocusts pulsarty.	This, pallid and seduced; pupils widely diluted
15	30	. for six poetly after elements.	
20		. 107 MAY EXCELS MARK OF EDITIONS.	torner, arounit, shows much torner.
55	50	- 40 100	Very pole and assemble
	200		Conf. Long and Street
11,	20	for eighteen months upon admir-	Pale and very feeling livid on-
1		nice.	tremiting nints dements.
20	20	for ten mouths pring to admission.	Tweat-famous middenthands.
54	06	Confirmation that the section to a first inches	
150		peniatest throughout attack	
25	27	Airtory of loyeteria for two years.	Phthirical
76	381	persists for there toostlir after	Pepul endoly dilated; fashio bentile
1		administra.	besitio
TI.	18	for times houths prior to and done	Pale and anguin.
165		same this printer quest to a designment	
吾	(29)	in three mouths after admission.	Wide, distal pupils.
25.	Th-	in the free months before adaptoon.	Extremely this and reduced.
	-	and personnel up to discharge.	
38	25	for the mostles after admission.	Popili videly dilatel.
22	25	Mosetruation anygular.	Water to the state of the state
32	13		Very spare and palled, harmic ferms; widely-dated pupils;
-16	14		many serior
23	10	- 4 Immunication	Very anomie; lounic brait.
44	21	in the street of	Pale and chloratio
が大事をある	D	- " and make	Destand in our collins
100	36	and manty.	Professed wavy pather.
7	17	for a short period:	Widely of lated pupils.
21	25	regular.	Very pallid, weakly : great stuper.
45	14		Very pain and mantair, developed
44		regularity subsections to admission.	spinal disease.
41	10	Suppremies or anegularity throughout at-	Very yole and ansunts.
**	100	tack.	And her and answer.
42	17	Scontrolling becoming for the first time	
0		ortalitated.	mark and the second
43	25		Extreme anomic pallor
		prior to administra was suppressed on	
11	100	irregular throughout attack	
94	12.1	Delerred patienty,	CONTRACTOR OF THE PARTY OF THE
52-	15	Deterred patents catagonia established	Diensk jugning
		seres, works after admission (recetery).	and the second second
46	1211	Deferred property instances as not retablished.	

in whom menatrual decangement or notable amenia prevailed in association with this form of invanity.

We must bear in mind the fact that every fresh development in the organism is attended by a correlated development in the nervous centres which represent the part; and that in no case is this store marked than when the organism attempts to reproduce its kind. Thus, at the menstrual moliness, when the germ is produced and shed. whatever he the mysterious inflounce which leads up to this effort, the able and flow of the developmental tide is registered faithfully in the nerrous centres by a similar ways. At each menstrual usdimen the sernal characteristics are more strongly emphasised by well-recognises: mental states; and, o fertiori, derangements amenorrhoul, dysmenerrhoal, ko, are attended by deranged cerebral functions correlated thereto, and the result of discharges of grey matter. Thus most of our cases clearly show exacerbation of their mental symptoms at periods corresponding to the natural monthly term when this could he ascertained, either when the flux was present, scanty or absent. Ovarian excitation and increased functional excitation of correlated nervous centres are set up by the same influence; and this influence may expend itself constinue on one, and constinue on the other, system almost exclasively. It is thus we find a considerable proportion of our cases of insandty still unattended by any actual evidence of derauged evario-steriae functions, just as amenorrhoul states may be anaecompanied by serious mental disturbance.

The development of the organism is (at such periods as we are now engaged with) strongly affected by the convenience and suployment, social influences, and educational systems will greatly openly the growth of mind as it does that of the body. In either case the natural lines of development may be blocked by unfavourable social surroundings, a vicious educational vide, or by unhealthy occupations, which, while they undermine the physique or check its healthy expansion, often affect no food for the mental life, but its warf its stature and cramp its unfolding energies. The periods of patenty and adelescence are pscularly prone to suffer thus in the present day, when the struggle for existence amongst the power classes often demands a self-imposed bondage of body and mind, by which the conditions of life are too dearly purchased. It is amongst the power class, exposed to such unfavourable conditions of life, that we find the worst forms of insanaty of the adelescent period prevalent.

The Blood in Stuporose States.—In this connection, it is of interest to note the constant and often profound implication of the blood in cases of adolescent and pubescent insanity, characterised by a notable degree of steper. The following cases illustrate ferribly the improvershment of the red blood-corpuscies in such indirects:—

ABSTRY OF HAUSSAMEN IN BLOOD OF ADSCRIPT STREETS (MARK AND PERSON).

Professibly Steparon.

	Barryson.	Corporation	White Companies	Opposite Commercia	Tanasa.
C. W., 10cs, 1, 57, Nov. 2, 87,	Por 51 50 10	Fer tuento 1881. 94.2 132.8	For locate unit. 20 04	41	Complete relique into stapor. Stapor al seven days damation; infanceia sunty function days ago; second time state admission; faceboary assume,
Jive. J. W.	22	107-8	-10	97	Upo Marched, popels recent, isoacharbo, Cheepful and active at announce continues; inscretely again publy and announce desidedly
Z4c 11/88.	100	115	10	76	During menetral period; cala- ments wernal; lively, charty, jumbs; thout congulates
L. R. S., . Nov. 4, 37.	70	107:2	29	-64	Goat Maper: while thated
E. H., Sep. 28, 35,	ās	14.2	46	70.	Meliantalia i professal pallor.
Oct. 8, 97, Nov. 4, 92,	50	65 30 ×	22	76	Cheefid and lively.
M. A. P., Nov. 15, 37,	74	55 6	-25	78	Intersementary behavior talkenti
H. S. L., Nov. 2, 87,	78	102 %	世	76	Compulsory feeding. Considerable stages and heavi- ment; not works and scales when addressed (pupils large)
W. S., July 25, 88, July 26, 88, Aug. 2, 98, Aug. 12, 99, Aug. 12, 99,	68 70 74 68 90	100 100 75 100 100	2000年	· 公司	us catalogue; fair colour Class of professed stupes of ser- eral years' denotes; (83, '86) reported at page 188,
B. W. J., Aug. 10, 388.	555	126	38	44	Quite mate, yet far loss stuper (has on afassoom; jeepesst- mer, but skrick's, expression-
E. H., . July 29, 37.	78	17.2	-60	90	uilm repose.
T. T., Aug. 2, 87,	68.	16	149	73	Melanchely with scaper.
Styl. 98, 97,	72	55	-29	-84	Hysteris cultiments occurrently impulsive, trouchirous.
T. No. July 24, 82.	60	115	-60	-52	Stuper martarhites.
July 26, 85,	59	125	105	31	Steper persistent.
Aug. 2, 92, Nopt. 25, 97,	35	110	4	-04	Cheery and spech insperced; has
M. B., On. 1, 87,	72	118-6	-15	61	Belayer of hydrocomicany, Schrightly county mentions than, considerable man.
Nov. 16, '87,	22	542	-22	:65	Catagonia posent, seath more observe and communicative
W. B., Mar. 4, 38,	70	334	-535	-93	Melandady performed staper.

For the condition of the seasoning some on semaths under General Paralysis (p. 280).

In the Male Ser.

Sexual Divergence.-The divergence occurring at this spech does not proceed puri passe in both sexes, it appears in the male generally in advance of the female of the same age. In the boy the sexual instincts are earliest aroused. In the bay such instincts are likewise sublimated at an early period of his history, into higher smotional forms; and during adolescence the progress made in the direction of intellectual activities is more apparent, more obtrusive than in the girl. The female chiefly exhibits the recipiency of her nature at this epoch, the stale its projectivity in a life of action; the former is the receptive organism, as the latter is the effective and elistribution one. In the flooding of new arms of the coron-in the opening up of new tracts of tissue occurring during the development of the sexual organisation in woman as in man,* the consequent differentiation is due not so much to the development proceeding entirely along a divergent tract, as in becoming more pronounced in one direction than in another, and in bring more mivamed in the mule than in the female. The arousal of new instincts, the development of higher emotional states-vague yearnings, wide-spread sympathies, tender passions, halfunderstood promptings-bespeak in woman a high subjectivity, devoted, however, to the most generous strik. In man, on the other hand, the exputation of the aniable qualities is never so great; his love is from the first of a more seifish sature, and its further developments are likewise devoted to siter selfish curs. More calculating, more ingenious, more inventive. his schemes and plans of action from the first must, from the very constitution of society, embrace antagonism to his fellow-man in the competition and race for life. The dependence of the one sex is notably in contrast with the self-reliance of the other. Thus Darwis, alleding to sexual distinctions, says :-

"Woman some to differ from man in mental disposition, chiefly in her greater temberaces and less self-damen; and this bolds good even with avages."

Woman, coming to her maternal institute, displays those qualities towards her inferite in an emission degree; therefore it is likely that she would often extend these towards her follow creatures. Man is the revol of other men, he delights in competition, and this leads to implement, which power too easily into minishness. These latter qualities seem to be his natural and unfortunate highly ends." *

These considerations would in themselves suffice to indicate the divergence in type of mental aliment to which the two sexes are exposed at this period of life. Whilet the female shows a perponiterating effect on the affective sphere of mind, the adolescent youth

The correlation of those commident developments is men in the fact, that if man
be enumerabled, the second characteristics never appear (Derwin, op. 181., p. 187).
 + Dissuir of Men, chap. 100.

betrays an aberrant tendency in the reactive faculties of his mental being. His newly-awakened faculties, like all nascent montal products. are wombously fresh, active, and potent; horce, naturally tending to fabrily relationship from want of a dee contrasting power, his powers and shilities are vacily enggerated, and beget an unforemate egolumns. His plots and schemes savour of the wildest vanity; whilst the self-complacent all-sufficiency with which he reveals these plans betoken the overpowering of normal contrasting experiences by the sow-begot factors. Every faculty whereby he becomes a unit of power in the dementions social sircle is represented in false quantities, and a disproportionately intensified and overse-using self-steem is the natural outcome. The sexual divergence at this immature age certainly tells in favour of the gentler sox. The male adolescent has had his characteristics faithfully rendered by the amiable satire of Thackeray in the person of Fendennia, whilst his fradties have received less consideration at the hands of Carlyle."

The afflative emotional states, the newly-awakened instincts, the fixed of new impressions, and the sense of widely-expanding faculties, constitute a physiological stage of dovelopment which is natural to all at this period of their life. Its obtrusiveness will always be more or less noted; manife sports and execution, with a mulerate use of the intellectual faculties, will, however, do much to carry of the averflowing mental energy in a localthy channel; but of all faults, that of introspection and subjectivity at this age should be avoided. A false code of morals does much to foster this tendence, and has much to answer for in the intensification of mental anomalies in youth. Need we recall the religious ascoticism of the Middle Ages as confirmatory of this fact! A transitional epock, such as this, is surely not a suitable period for self-analysis; and this is emphasised by the well-known fact that youths, encouraged at this period by minguided parents or tutors to lead a too stuffious sedentary life, devoid of healthsome exercise, and to antiject their mental life to a pseudo-religious tenining, embracing rigid introspective exercises, lapse readily into the worst forms of mental derange-

^{* &}quot;I have heard it affirmed (early in just) by not emphiliantinopic persons, that it were a real increase to frames happeness, could all young men from the age of ninction be covered under burerle, or resolved otherwise terrable, and there left to follow these hantal studies and callings, till they emerged under and store at the age of twenty-free. With which engigestion as a practical scheme if measure countries. Nevertheless, it is plausibly taged, that as young ladies are to markined, precisely the most deligiated in those yours, so young gentlemen do then attain their maximum of detectability. Such grade are they, and beliefs proceeds, and you such volument integer for self-includency, to obsticate, obstrapperous, and quita-levium; in all senses so free and and so forward."—Sactor Bureries, "Griting the way."

ment, and indulge, above all others, in secret sine and sexual vices.

This period witnesses the profound changes of complete sexual divergence, and the attainment of those mental characteristics which distinguish the one sex from the other. The late spech is characterised by certain important features, which especially map it out as the carliest marriageable period free from special risks, and has, therefore, been termed the period of nubility (Matthew Duncon). This author shows us, that, if we compute the number of first hirths in newly-married women at different ages, we shall find that the greatest "initial focundity" occurs between the ages of twenty and twenty-first. Preconcus marriages expose the mother to the risks of death in child-bod, or, if she curvive, predispose to the bearing of an excessive number of children.

In women, the changes occurring in the pelvic boxes from puberty forward are, of course, of vital importance, and illustrate well the inomaturity of the assists abeleton for the full functions of maternity up to the age of trenty.

Symptoms. - The unbject usually comes before us excited, highly elited, his attitude, demeanour and expression indicative of intense self-complacency and assurance. The excitement may be very acute, attended with continuous garrulity, incoherence and movement, yet the buoyancy of spirits is a striking feature at all times. In the more coherent states the subject, unprompted, reveals his evalted notions; talks of his acquirements as a scholar; expatiates on his skill as a workman; revels in the supposed possession of rare and much-esterned faculties, of persuasive eloquence, of poetic taleat, of wondrous vocal powers, of the gift of tongues, of artistic shillities, or histricals powers of a high order; or his thoughts course in the direction of his manufar energies and capacities, he atenmes his strength to be almost superhiman, and regards himself as a champion walker, runner, wentler, or the like (F. S., p. 329). The extensionant nature of their delesions, already alleded to when dealing with the bysteric features of the female adolescent (p. 376), is peculiarly striking also in the male subject; the intensity of feeling reveals itself often in short, curt aphorisms, in the tendency to antithesis; in the gestures, pantomime, pass, speech and its contents, may be recognised, more than in any other species of mental demangement, what we would elect to term the true atazonto type of insanity.

Even if such beliefs are not definitely expressed, egoiatic sentiments prevail, and are the fount from which issue extravagant solvence of action. Inventiveness, ingenuity, cunning, are all assumed by this alien being, whose second life is awaking, though in an anomalous form, to the appreciation of the keen competition of existence. We observe a similar condition urise at a later period of life, in that fatal melady general paralysis; but here, to account for the symptoms, there is a far more profound structural alteration, which progressively becomes more and more involved, until atter fataity and paralysis result | yet in the early stages of this disease the same egoism, the same long ideas of the subject's physical powers, wealth, capabilities, ingensity and skill come to the fore.

Towards their own sex this self-assumed superiority calls forth often an aggressive conduct, an overlearing manner amounting to arrogence, which involves them in frequent disputes and quarrels. To the gentler sex their behaviour is often gallant and condescending, sayouring of a premotivus manliness which does not accord with their mental and physical development. As Dr. Clouston states:-"In the males been't notions, imitation of manly airs and manners, an obtruries paguaciousness, and, sometimes, a morbid sentimentality were present.". And again :- "The physical appearance of the males was boytsh, and of the females girlish." On the other hand, it must not be forgetten that such adolescent forum of insunity are prone to prurient thoughts and erotic promptings which make their objects of anxiety to their guardians in relation to the other sex. All the shore symptoms are liable to intensification by the vicious habit of maxturbation still further reducing the netrition of the nervous centres; above all agencies does it prove most powerful in feading up to chronic delusional Jusanity, or into hopeless dementia.

The cases of inunity occurring from pulsery to the completion of adolescence naturally arrange themselves under two categories:-

(a) There are those in whom maniscal excitement (often very intense) prevails, with the eguintic, self-landatory state alluded to; and often alternating with conditions of mental stupor and catalogue states.

(6) And there are those of a later age, in whom delusions are the prominent characteristic—delusions more often associated with melancholic depression than with maninoil excitement.

In fact, the proportion of delusional cases occurring between the ages of twenty-one and twenty-five is far greater than that which occurs between thirteen and twenty-one. It has already been remarked, that cases of melancholic depression are of far less frequent occurrence in the female than in the male adolescent, and since adolescence is completed in the female earlier than in man, age possibly has much to do with its predominance in the later adolescence of the male sex. Our statistics indicate, that of all cases of insanity apparently influenced by adolescence in men—i.e. from the age of fourteen to that of twenty five, incinnive—about one-half scene up to

[&]quot; Latterer on Mental Dissers, p. 252.

twenty one years of age, and the remainder subsequently, or, to be exact, 142 occurred before twenty-one, and 135 afterwards and up to twenty-five years of age. As in women, so in men we find that there is a rapidly increasing number of most from the age of fourteen up to that of twenty-one.

As modified by the vice of masturbation, we find the prevalence of pseudo-religious exultation, indulgence in cast, and development of fixed religious delusious. One patient conceived binnelf transferred into the Aluighty; another believed he was impired by spiritual agency and could perform miraculous works; mostler had the gift of tengues. Then some periods of great impulsiveness (often prompted by visual and sural hallucinations), sudden ferocious violence, indecent assaults upon the other sex, and even suicidal acts of determined character, attempts at cape, strangling, drowning; these are not unusual Seatures in the masturbatic adolescent. The type is by no means always that characteristic of the ordinary same masturbator, for, though the physical symptoms of cerebrospinal irritation may be equally promixout in both, yet the mental ailment borders more often on that of delimional insurity. The shy, averted look, timidity, obsequiousness, and shunning of society, may be replaced by a bold audacious bearing, a shameless confession (and even defence) of their habit, a shocking disregard of sleeency, and an entire absence of the sense of moral degradation. Even if the vice he concealed, the pale amemic aspect, the dark arcola around the eyes, the dilated pupil and the general atony exhibited in feeble heart and languid circulation, enfeetiled motor power and disturbed co-ordination, the annexic states, occipital headache (Spitche), the vague unreasonable sturm, eccentric dislikes fostered, and unfounded suspecious, soon attract our attention.

J. M., aged nineteen, into one; aftertied June, 1882. A paternal torde died demented; a second counts, K. M., is at present a patient in this limitation—no intemperation. J. M. had been addicted to maintribution since the upo of function, and though non-close after some time of no proportical effects, was enable to discontinue the todal gence. During the four years preceding his administra to the arginum be grew more and more despondent, brooking over over his libble and Proper-book, reglecting his work, and sundering obstractedly about the fields. This condition was interrupted by longer and aborter remissions, but finally settled into a permanency of deep deprecion, the settlement of which appeared, some fire months before being put inside case, in a second-determined to associate himself. Immediately on its performance he had two convolute sensors, rot, however, remering. A short period of mental improvement followed, and then he became were than ever. Three years before this commence he had had a full form a hopfort upon his bond.

[&]quot;From the age of thirteen to that of seventeen there were 40 cases of insanity out of a total of 3,00%

When adminted, he was tearful and much depressed, but communicative. His object in cultistion was "to prevent the possibility of minuscription," but the object attained, he was revecues by fast of having "our himself off from God, and test his coal." This belief he maintained during his residence, but become nevertheless more slightly appressed by it, loss glocary and despondent, and decidedly improved in some points, insteamly as he employed binnelf actively, and showed activity. Was sent to home one at the expendition of fourteen weeks.

Without attempting any refined analysis of the multifarious groups which might be comprised under the head of invanities at adolescence, still less attempting to dignify with specific significance the varied symptoms of such groups, it will best serve the purpose of the student to direct his attention to the symptoms proper to mannity at this period of life, and to the weslifying influence of vicious habits of life, e.g. manturbation and drink | intercurrent affections, such as pathonic; or defective states of the blood, as in assemis. And first, let us draw the distinction clearly between the forms of insanity arising during adolescence, and these subject to the modifying effects of maxturbation.

In drawing such a distinction we must keep in mind the fact that the vice is so frequent that a pure uncomplicated form of insanity at this period of life is the exception, not the rule. As already stated, a great proportion of our adolescent cases are found to be mild cases of congenital defect, and these are, as is well known, peace to the vice.

Again, the period of life is prone to induce the labit in a case of insanity of any standing, even if the subject were not previously addicted thereto; and in the later stages of such unfavourable cases as lapse into dementia, the habit almost invariably exists.

In a pure uncomplicated form of insanity at adolescence, we find the patient in a state of sub-scute or scute excitement, with exalted selffeeling. His egoism (which is the prominent feature) is like that of the victim of general paralysis in its obtrusive aspects; there are notions of wealth, superabundant energy and power, enviable distinctions and rank, a general feeling of bles live; or the youth may have wondrous plans in view, exhibit restless energy, increment asheming, yet withal he shows a frank, hold, generous bearing wholly distinct from that worn by the mastarbator. He is garrulous, obtaugue, often objectionably so to his elders, not there is nothing of a repulsive character. His egoism is ever tending outwards towards the realisation of his plantom schemes; there is no self-engressment and abstraction. His egoing, again, has more self-confidence, and appears as a self-assertiveness and assurance, so well grounded in the patient's sentiments and beliefs, that opposition, discent, restriction appear impossible, or two contemptible to be taken into account; there is not the fear, suspicion, hatred of the environment festered by the other form. Then, again, the physical symptoms due to the

vice are absent in the uncomplicated form. The recoverability, again, of insunity at adolescence is very great; the prognosis in insanity modified by ossession is very grave; in fact, the majority of unfavourable cases of the former are accounted for by the frequent lapting into this habit. As multiful by the vice, however, the mental symptoms are those of a narrow regulaive egoists. favoured by pseudo-religious hypochondrians, often with much shyness and reserve at first, but later on, obtrative and unseemly (F. S., p. 329). The pseudopietistic nations early developed, long before marked mental decangement is actually recognised by the patient's friends, are of the most cromped and selfish nature. Obstinate narrow bigotry often results in a complete intellectual famine, the patient becoming a prey to some sectarism community, which succeeds only too well in checking the due expansion of the moral nature, and in festering the self-opinion and conceit of its victim. We find the parents often speak of such an one as of deeply-pious habits of thought and life, as eminently conscientions, so of an aminble, modest, and retiring nature, failing wholly to realise the desp-seated agains and self-contemplative abstraction which has beneath each natures.

With this morbid subjectivity there is often associated much timidity, anexplained dread, tremblings, frightful dossus and "nightmares," often hysteric seizures. In the intellectual sphere there is a great wast of spontaseity, lask of energy and mental movement, which may border on indecility; irritability, spasmodic temper, impulsive conduct alternate with gloom, despondency, torpor; the mood is very variable.

Then, again, hallucinations of sight and of hearing very frequently prevail; and often explain the timidity and terror of such cases. The physical symptoms are no less striking than the sental, and bespeak the wide-spread exhaustion of the cerebro-quinal centres. Such symptoms are—the surenic aspect, associated with general atony; the dilated pupil; the languid circulation and vasousstor paresis; cold thus extremities, a sense of weakness in the lower extremities, and a slightly stanic gait, often awaying and inco-ordinate movements.

We thus see that the symptoms indicative of the psychosis, incidental to this period of life, are far different to those aroused by the vice of mastarbation. The system and afflative state of the maniscal adolescent are readily recognisable, but their symptoms undergo varied medification and intermixture upon addiction to this vice. Thus, when we find the adolescent, instead of improving rapidly, makes several partial recoveries only to relapse, and especially when such relapses are towards mental torpor with general lack of muscular energy and vascular tone, we at once suspect addiction to this vice. So when we find the averted glance, the widely-dilated pupil, the expension and demeanour indicative of effeminate self-engressment.

and delusions based on the sexual instincts, indications of sexual purversions or intensified egoism, we naturally look for a similar origin. Aural hallocinations, timidity, distrust, loss of self-confidence with this concentration of the self-feeling are all hartingers of the name vicious habit.

Etiology, -A very large proportion of the cases of scute excitement are constituted by congenitally weak minds, and the number of such moss which precede the age of twenty-one is nearly double that of those which follow; in fact, the age of palerty and adelescence is poculiarly the trial-period for autjects of congenital defect-then, if at all, will their deficiencies become notably prominent. This remark does not necessarily apply to cases wanting in intellectual aptitude, but rather to those with the defective moral control which characterises so many of our cases of congenital weakness. The whole moral being, as we have seen, is subjected at this period to revolutionary changes through the incoming of new sensitions and the turnoil produced by this interpenetration of the old self; now sentements spring into life, freshbegetten emotions (redendant in energy) tend to further overthrow canons of belief; and the sudgment is strongly awayed by such overlulancing factors. At this period, if at any time, is a duly-balanced noral control necessary to the well-being of the subject. How often it fails is too fagrant a fact to be dwelt upon. How much of such failure in due to immature and narrow systems of education, to victous and cramping customs of life, and to injudicious parental training is also only too apparent. Of the most vital importance is it that the lines of development of the moral nature at this critical spech should be watched with the greatest interest, and that the parental and intorial guidance should be of the most enlightened and prospective kind, to insure the due integration and elaboration of the clustic mass of improvious increwiling at this stage of mental evolution. It is out of such misguided states arise the religious fanatic, the sociid sensualist, the repulsive manturbator, the nerveless sentimentalist, and the vicious and impulsive characters who are to the end moral wrecks, bearing witness through their lives to the violence and tyranny of the adolescent storm. It is the epoch of great moral convulsions, which in the insane is accountable for those extraordinary delucional concepts of a religious character, which leven in the insane) have so bigarre an effect. The ideas of being crumfied or of being subjected to martyrdom of a revolting kind, of being transformed into the Almighty, exemplify the kind of notions which readily spring into life at this epoch in those who because alienated. Such conceptions, it may be noted, would be scarcely possible at a much earlier age; they deal with the subject-matter of late periods of development, the material of religious doctrines and sentiments, and therefore indicate as early

demulation of exciving mind. Prior to the mental commotion of puberty these seved indecide have, maybe, shown an aptitude for learning, a brightness of intelligence proportionate to their age, and little (beyond as ill-governed pussion, or vicious or srael tendencies) to indicate the approaching danger.*

When the sexual instincts are aroused at pubersy, their dwarfed morale renders them easy victims to the vice of masterbation, which, perhaps, is the best criterion of defective moral control. If persisted in, it no longer remains the symptom of a mental defect, but the prolific source of a deopening maludy of the norvous centres, whereby the mental affection is itself coloured. Masturbation as a symptom of disease, is, of course, prevalent in insunity at all puriods of life; but adolescence is the epoch, especially, when its indulgence is apt to be the exciting cause of a grave developmental malady, which otherwise might have been tided over. We have on more than one occasion watched the adventof puberty in the successive members of a highly-neurotic family where inamity, drink and apoptery had been the ancestral curse, and have seen one after the other successib to this speck of their life, the vice being incounitely engendered as the sexual instincts came to the forc-There are few physicians who do not meet with numerous instances of this class.

The explosiveness of nerve-tissue in the imbecile is a characteristic feature of their case, and we can conceive no condition more likely to inno in the impulsive forms of insanity than that of a vicious indecile arriving at the period of puberty and a victim to a perverted sexuality.

Prognosis.—Of all types of insanity that somering at the purposal period is one of the most secondaries (80 per sent), yet the provery rate in nearly as high for the insanity incidental to adolescence; in the female are the manis runs a course of some mentia, asually marked by one or more relaposa, but one half of the cases recover by the secondariand manify three-fourths are well by the teath mentia. (See Chert &) It is far atherwise with the same affection amongst men; in them, where (as already stated) deprension is often largely present, the prognosis is far less favourable, and a wide margin must be allowed for partial recoveries, chronic incorables, and fatal cases. On comparing the percentage of recoveries in postperal, adolescent male and female cases, the above statement is fally verified, thus:—

	Property	Abbecom	Advanced
	Chan.	Frenklet.	Males.
Recovery rate per state.	. 90-0	23.0	58.4

A glance at the following table of results of treatment in either sex, will indicate in no uncertain terms the more unfavourable nature of this form of immuity in the male sex :—

^{*} See also on this against Dr. Hack Take. Psychological Medicine Ast., o Palamorat Insuraty.

	Fermont	Bellevel	Section!	Dist
Female whilescents per count., 2	22/3	7.0	13-5	274
The second secon	58%	144	15 %	9.7

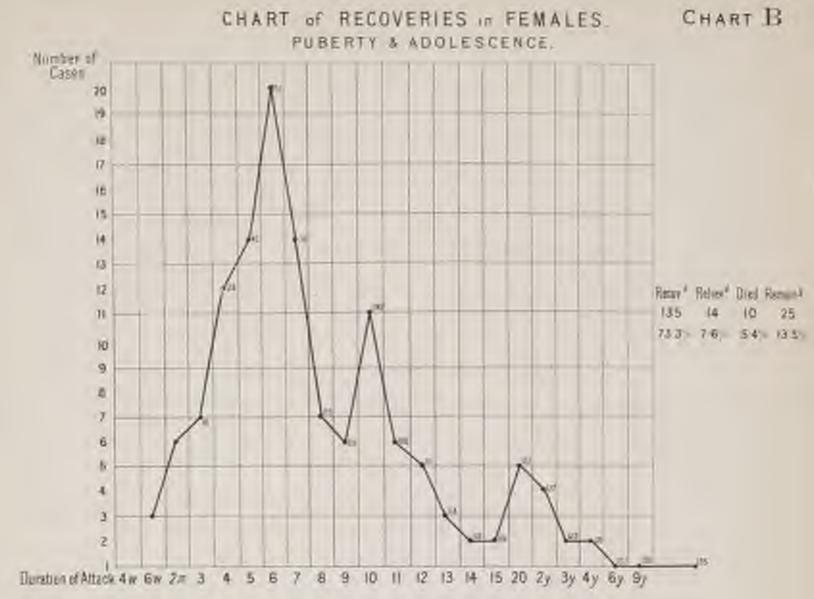
The unfavourable cases form 26th per cent, of the total number of cases in females, and \$1.4 in males.

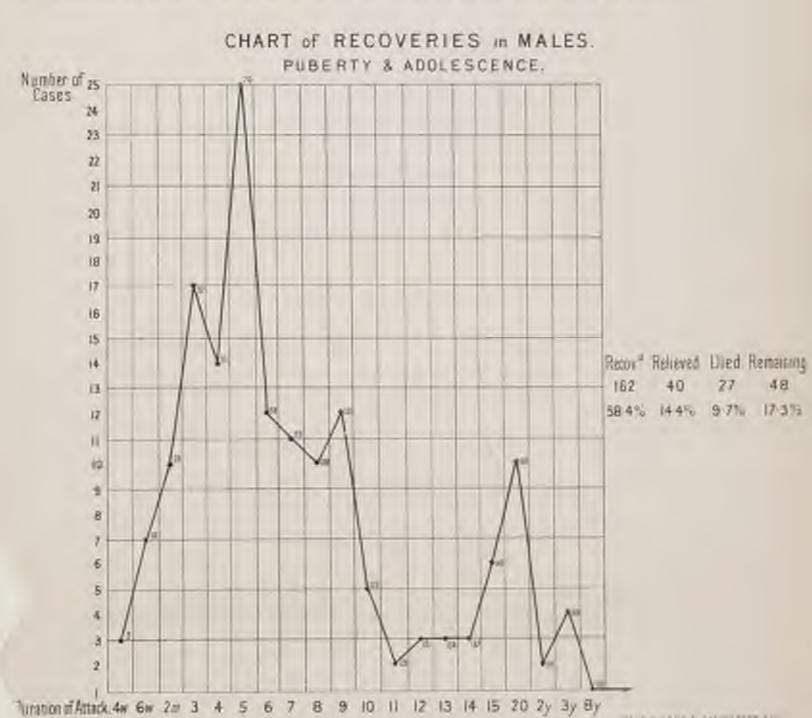
We have already alluded to the actual recoverability of this form of insanity in its relationship to sex; it will also repay as to observe more particularly the duration of the attack up to cure in both seven; in other words, the recovery-rate as affected by time. (See Chart &.) If for this purpose we glance at the chart of recoveries first as regards the male adeleacent, it will be evident that shring the first six weeks but him cures will result out of a total of one hundred and sixty-two; during the next fortnight an addition of ten recoveries just doubles this number, and then for the third, Sourth, and fifth months a rapid ingrement of cures-wig, seventeen, fourteen, and twenty-dye respectively; so that the summit of the curve is reached at the fifth month," by which period nearly one-half or the total namber of cases have recovered. Then a sudden drop midway occurs for each mouth from the sixth to the minth inclusive-i.e., from ten to twelve cases for each month respectively. From this time up to tweaty months the monthly curve once only rises above four, being usually much lower, and a few rare and unexperted cures occur (as in other forms of insanity) at later periods still.

Now the curve of recovery for females differs considerably from the foregoing, being less abruptly broken, being more uniform and bustained in the early half of the period of recoverability, I and exhibiting beyond this but one abrupt elevation; also by the critical period, if by this term we may so make the period of greatest recoverability, occurring from the faurth to the seventh mouth, and not as in the male adject from the third to the fifth. From this it results, that whereas one half the male recoveries are established by the fifth month, anarly seren asseths dagge ere a proportionetic number of females receive. The second alreapt rise of eleven cases, and as sudden a fall shown at the teath month in the female chart, reproduces in a modified form the mutained recovery-rate shown between the mixth and ninth manths in male adolescents. From such a clears we might augur that the chances of recovery, apart from any specially favourable points inherent in the case, are equally good between the fourth and seventh months from omet; that if from some unforcumble element in the nature of the case recovery does not then take place, a further hope may be enter-

[&]quot;It must be remembered that the period dealt with in these charts in that beturns would next of imaging and recovery.

^{*} The period of re-operativity may be agreemently food at two loc mouths from the most of the immany of the few resources subsequent to this date not multiving strongly against the utility of this doctrons.





WALK OF TOME & SANTERS ASSESSED.



tained of recovery at the teath menth, beyond which the chances are greatly reduced; and, also, that if a male adolescent is not included in the favourable list of curse up to the fifth month, we may still hope on with reasonable expectation of recovery to the ninth month, beyond which the case must be regarded as assuming a serious character, and the author's is certainly ominous.

Not only are the cases prior to the age of twenty-one more often characterised by excitement, but the type of inearity then precalent is distinctly a more recoverable form; the recoveries in the earlier contrasting with those in the later period, as ninety-one to seventy-one. In other words, if we group together the partial recoveries, the fatal cases, and the chronic remnant as the expansionable olos, we shall find that such a class constitutes 31 per coun of the acute forms of insanity, and 45 per cent of the metancholic forms; in fact, the chronic cases are double, and the partial recoveries ("relieved") more than double in the metancholic, that which obtains in the maniscul torms.

Treatment. - The simpler forms of bysteric excitement occurring at this period often do not call for other than moral and dietetic measures: removal from the home circle and possible sources of irritation to entirely movel relationships, the administration of a due amount of aliment, regular labits of life, and means to ensure alone will often suffice to effect a cure. Nourishment should be given in an easilyassimilable form, its nature dictated by our knowledge of the systemic wants at this developmental phase of the patient's life. The secretory and exerctory organs should be especially attended to, liable as they are at these periods to derangement and sluggish action. Sleep should he seesed by out-door exercise, active employment, commensurate with the patient's powers of endurance within the limits of absolute fatigue; selatives should be stuffounly accorded. It is only when prolonged instannia persists for several nights together, in spite of the above measures, that acclutives are adminable, and then a single done of chloral, sufficiently large to ensure abscintely the desired assount of rest, may be given; its frequent admislatestion for this purpose is to he strongly deprecated. In such cases as inherit a strongly-pourotic temperament, and in which the cycle of developmental change has not resulted in much physical overstrain and wear and tear, large dose of potassism bromide (30 to 10 grains three times daily) may be adminintered with decided benefit to long as a due arrount of wholesome food can be taken. Most often we have to deal with the menatrual irregularities of this epoch and its attendant anomia, our subject having succumbed to the developmental wave; the natritive and assimilative capacities having been overtaxed by the exaggerated demanda of the growing organism. Here a strictly-hygicule regimen should be excefully and permittently enforced, such as out stoor exercise

and the spinal descrie or sponge-bath. Iron, especially the carbonate, should be given in pill or mixture. It is well to vary the form of rece, occasionally administering it in the form of iron and aloes pill; or as the ammonia-citrate; or as the sulphate of iron in combination with extract of nox vertice and rimberb in pill; or again as the compound syrup of the phosphates with mult-extract and cod-liver oil.

INSANITY AT THE PUERPERAL PERIOD.

Contents - Symptoms - Protessinance of Manus. Indeedly of the Morbal Process—
Otherwise Second Element - Halbacautions - Delations of Surpices - Prevalence of Sciental Verlags - Existing - Succeptibility of the Pumperal Period - Illegitionary and Prosperal Innastry - Progressy in Progress - Condition of the Illend - Dimention of Hamoglobia - Progress - Treatment - Insuity of Progressy - Helatively Infraquent - Principate show no Special Liability - Symptoms - Recoveries.

Symptoms.-The onset may be absolutely audden, following upon stellivery | but more frequently the development is gradual, being proceded by evidence of nervous exhaustion, until the fully-matured disease bursts out in all its fury at the end of the first week succeeding labour. The patient suffers from early immunia, becomes restless, fidgetty, unnaturally garvilous; she exhibits a waywardness not entowary, takes strange and unresistable dislikes, especially towards her hinhard, or refuses to have her infact, benight to her. There is a furtiveness of glauce auguring a ampicious state of mind, a startled look on the alightest sound, or even intolerance of light. All her relatives observe a change of disposition, and perhaps attribute it to a wilful temper merely, but the pulse becomes hurried and small, the face pale and higgard, the eye startlingly bright. She cannot be induced to aleep, or sleep is broken by disturbing dreams, from which she starts up in bed rambling in disconnected attenuess. Then come hysteric octoursts, extravagent conduct, and all the features of an acute manincal attack. The presence of delusions and hallmonations declare themselves, she shorts aloud to imaginary persons, listens to their voices, rejects her field with repugnation, declaring it to be pointeni.

Maniscal excitement usually characteriess these outcursts) out of its prosperal cases as many as 45 or 65 per cent, suffered from manin, whilst states of depression prevailed in 23 patients or 31% per cent. If we assessate with these the cases which, originally prosperal, has been allowed to another their industs for some time after symptoms of scental allowation had been observed, we get from a total of 111 as many as 74 or 65 per cent, as subjects of manin, and nearly the same proportion, 30 per cent, as subjects of medianchalits. The mental affection, then, at this stage is consuttally an aguste maniacal state, in which there is interest continuous, great incoherence, continuous purvality, and a dangerous explosioesce, which may interest desperate impulsive conduct; there is, moreover, a special proclivity to indulgence in obsesse language, indecent exposures of the person, and genuine nymphomaniscal states; or the deep-rooted protic feelings may, partially controlled, reveal themselves in the sudden gentures, or sensual glances, or provient demonster in a less obtrusive manner.

There is, despite the adverse view of high authorities upon this point (Goock, Morce, Forille), abundant evidence in support of the view that this occurs element stamps the insanity of parturnion and the carly paerperal period with features which demand special attention; but whether such features should exalt the mental affection into a distinct mosclogical entity is very doubtful, and, in our opinion, unjustinable from considerations already appealed to.*

Hallucinations.—Visual and arral halfscinations, or both combined, some to the almost complete exclusion of other forms of sensory disturbance; in fact, 17 per cent, of our presperal cases exhibit such ancualies—the average for the total afmissions in all forms of inantity being 27 per cent. This is not so high an estimate as that of Dr. Clouston, who also assumes the annal to be the more frequent; in our experience they occur in about equal frequency.†

Delusions. - Quite 61-2 per cent, showed obvious delusions of very varied character, but shiefly tending towards ideas of persecution, the patient believing herself the victim of intrigues at the hands of hernearest relatives her husband children, her former friends and neighhours; her life, or that of her children, is threatened, or some terrible. tragedy is being exacted; in two cases, the house was believed to be haunded. Ideas of puisoning are prominent features, the food being frequently rejected upon this plea. Another not infrequent deluzion was that of a sexual nature; the husband's fidelity was called in question, or there were bless that men entered her bedrecen at night. for illicit purposes; one patient believed herself to have been confined of twins who were falling into a careal. In five cases the subject believed herself sternally lost, forsaken by God, and given up to the machinations of the evil one. This delinion that the soul is lost was as frequent as in forms of insanity of a more metancholic type, occurring later on during luctation; in fact, religious deluzions were frequent, Hypothandriacal delusions were not observed in a single one,

To take a brief summary of some of the more important halfucinations betrayed by pursperal cases:—

^{*} See also on this point Dr. Sunkey's Lotters in Francis, pp. 126, 166.
† Vide Lotters in Mount Disease, p. MG.

Fixen becomested with blood peop through the workers a spirits heree around a angels and devils curround the bed; the patient's descued mother confronts ber, and mysterious lights flit about the room; voices are heard; the form of the evil me appears; or they shoul about to imaginary voices; mends are heard, interpreted as comprehen beneath the building; or a voice within prompts her to marieb.

From these considerations it will be obvious that the general tone of feeling in that of distrust and suspicion, implicating her conjugal relationships, her friends, and former associates, or as affecting becomen well-being; or other failure of self-confidence and delimins, sometimes of a most harrowing description, based thereupon.

Suicide.—We have alluded to the explosiveness of the disease, and the tendency to impulsive acts in a most notable feature in insanity at this period. Attempts to murier the affiguring have been frequently recorded, and no woman suffering from this form of insanity should be brought into close reintimohip with her children. About 15 per cent, presented sedier envision proposation; but nearly double this proportion, or 17 per cent, were impulsively dangerous to those around them. The succidal impulse was often prompted by definion; thus, one patient believed her husband wished to cut her threat, and, consequently, sprang from her bedroom window. Another leapt from her window under the impression that her husband had just murricrost his two children, and aniser similar impressions. One case tries to end her days by a desperate attempt at strangulation, and another by cutting her threat.

The various forms of scental disturbance found at this period may be thus classified in the order of their frequency of occurrence:—

Acuts mana, , ,				0	32 care
Melantelia, with determin.					63 11
Marie, with delaware,	4	-	-		7
Simple mitolity				-	7 11
Simple melanolodis;	- 0				8
Attite tiplandolis,					1
Melarately, with steps:			-	4	1
					65

Etiology.—It would be indeed strange if, at a period embraring such revolutionary changes as are comprised in the oncet of labour and the first half of uterine involution,* the mental stability was not endangered beyond the average usual at the same period of life in the non-parture at. So numerous are the novel relationships into which the nervous system then cuters, and so powerful are the new agencies brought to bear as excitants to morbid reaction, that subjects bereditarily predisposed to insanity, must necessarily incur insument

[&]quot;The term "pureperal minia" is arbitrarily assigned to the mental decaugement occurring charles the fire as sends of the purepered wate, involution of the unerus being transity not complete for three months.

risks at this crisis of their history. As Burrows says:—" Gestation intsolf is a source of excitation in most women, and sometimes provokes mental decongement, and more especially in those with a hereditary predisposition."*

Let us consider what are the peculiar circumstances which favour such issues. First, there is the mental transformation incident to this latter period of gestation; the around of maternal instincts, especially for the first time, is frequently associated with unstable states of nerve-centres, issuing in introspective states, exalted selffeeling, voluminous emotional waves, vague fears of impending troubles, and often bysteric ostbursts. Such conditions must be attributed to the eccentric irritative of the gravid aterus, as well as to the deteriorated state to which the maternal blood has succumbed; and, unless the deparative processes become more active, nutritional anomalies are liable to grass, producing undue nervous instability during gestation and subsequent to parturition. If the functions of secretion and exerction be checked, as by loaded howels, or the respondation of merbid products in the blood, a source of irritation to the servous system at once appears; and, if allowing ris cownist, the weenic state of the blood may tend towards actual conculsion ! Then come the physical and moral shock of labour, the emotional tension, and recoil of this misis; and, lastly, the immediate and more remote consequences (local and general) of partarition,

The physical and moral shock is ever a varying quantity; but, in all ones, receives exhaustion to always attendant on such an encremous outlay as is demanded during partialties, especially to those constitutionally enfeelded, reduced by the allments of the later stages of gestation, by insounia, or by a tedious protracted labour, or attendant hamorrhage. The secret shock is regarded as an all-powerful excitant to mental allments of this period, as illustrated in cases of illegitimacy; and authorities have constantly drawn attention to the prevalence of purposal insanity amongst those who have borne illegitimate offspring. "Esquired speaks of a sort of frency incident to unfortunate girls in giving birth, in misery and secrecy, to hastare children; a condition of mind, which it is to be feared, often prompts either infanticide or micide.";

Again, subsequent to labour, we have the whole uterine surface expensing the system to the perils of hamorrhage by imperfect contraction, to recention of encretery products, to the absorption of

^{*} Community or, p. 363.

[†]The aromic element in the constitut of purposal estempts has been called in question; nor, horsever, the rest apprecia countrie to Te. Govern in his Disagree of the Nervous System, vol. ii., p. 716.

² Nurrows Characteries, p. 264.

soptic agencies, metritis, phiebitis, and its attendant evils." Later, still, come the evils due to imperfert deparative processes, regulate for the removal of adventitions products during the alow involution of the uterine muncle; the fatty disintegration of the giant-filter, and its replacement by the nucleated fibre-rell, which prevailed in the stalliparous state. The products of such disintegration found optically in the lochia, and probably as the fatty elements in the urine, and rancom elements of the early mammary secretion, will, if these secretory and excretory functions be arrested, lead up to the evils now alladed to. In fact, the whole puerperal period is one of extreme susceptibility.) The explosive condition of the nerve centres is at its height during parturition, and it is then, especially, that eccentric irritation of the cerebrum may lead to transient psychical anomalies, or to the motor discharges of general colampute convaluious; and it seems but a question of individual ansceptibility, or intensity of the eccentric irritation, which determines the que or the other, the psychical often preceding the convulsive phenomena-Thus, at the acuse of a supreme uterino effort, and especially during the passage of the head, if large, in excitable primipare, the intensity of the pain is often accompanied by complete, though transient, alienation, by grave reductions in consciousness, by rambling incoherent talk, by outrageous and impulsive actions-the new-born infant may be earrificed to the mother's frenzy. ;

Illegitimacy.—I have already drawn attention to Esquirof's statement of the prevalence of insurity amongst those who have borne illegitimate children; it has also been shown by Dr. Clouston that this cause is a potent factor in Scotland—where illegitimacy abounds. He estimates that 25 per cont. of his cause occurred where the offspring were illegitimate. When we take our English asylams into consideration, the results are far different; illegitimacy is far loss rife; and it appears that out of a total of sixty-six cases sixty-one were married, and the children been in legitimate wedlock, whilst in five only were the patients unmassried women. Now the proportion of single to married patients in the total admissions of 1810 cases was 15 per cent. to 50 per cent respectively; honce the proportion of 10 per cent, of single women who suffered from previously insanity is exceptionally low.

^{*}Ser "Cleared Illustrations of Pursperth Innestty," by Re. Compbell Clark, Lower, ed. S., 1883.

[†] Burrown op. rit., p. 506.

² There is, likewise, a temporary delivers attending a compaging difficult labours, in the form on the accretion of milk, in the influencement of the lapane. Burrows, it, p. 364.

a Dr. Mardeal estatation the frequency of discriminary to a factor or 11.7 per cent, and determine Programs' Despity, 1886.

Frequent in Primiparm.—Frequent child-hearing has apparently no connection with the development of insunity; of the sixty-right pureperal cases, twenty-two were first confinements, or a percentage of 32G; 20-5 per cent, had had two children; 10 per cent, and 14 per cent, respectively had had three and four children; and of those who had families ranging between five and nine, 23 per cent, were also represented.

Second attacks occurred in eight cases, of whom two were primiparas, and the remaining six had families ranging from two to nine. No case had enforced from a third seizure.

The Blood in Puerperal Insanity.—Tested by the homoglobinometer the amount of homoglobin was found below the normal, as instituted by the series of observations recorded in the following table —In the case of R. W. J. it amounted to but 55 per cent., and in C. C. to 60 per cent. of the standard of healthy blood; in two other cases it varied between 74 per cent. and 78 per cent. The first case of the tabulated series (M. A. M.) in which profound amounts had resulted from post-postom homographics, gave upon one sociation as low a perscatage as 20, rising subsequently to 32 per cent. Both specific gravity of the blood and the amount of homoglobin have been lately stated to be lowered in states of mental excitement, generally with much muscular activity (Poveter).

AMERICAN OF HARMOGRAPHY IN THE RESIDENCE OF PERSONNAL PRINCIPLE.

	President	Companies Per Break	Commission of the library of the lib	Value per Conjunction	Emilies.
M. A. M., (Oct. 1, 97).	90	A3 6	125	25	Extrace wary paties; blood recypnic surleys, and metantly reposites into server or withirwest a contain many minute cells
(Oct. 4, 97);	28	601	-96	48	His meter and Minemot our pumies.
(00.3, 37)	24	80-6	-12	-01	63 formed organization bolles; Mood
(Nov. 6, 87);	20	21.0	-56	-45	pair had the more consistence. Seed door all contains induste glodewing indicate feeding name boat to flyin dands- land shapes and markly poles up. With
M. A. P., (Nov. 15, 80),	74	33.6	28	21	reschemed for reservance past. Festioned metacholist, may pather of face; responsely feeling repeate. Many minute majustics in the blood, some of dual-left lets; larger surprofess inta- tors to the chamber measure it a
H. S. L., (Nov. 2, 30).	28	102.5	-21	179	considerable beings of purposers, much compare bell to reduce the plant of purposers
O. C., (Dec. 2, 32),	00.	89-6	23	70.	pupiled field belows for eight mount. Melous our correcte that, a her mail movies that while suspende mounts
R. W. J., (Avg. 10, 59).	55	126	-18	284	**

The corporcular violence (numerical) in the uncomplicated cases came near that of normal blood,* being 80.6 to 124 per bessic unit—i.e., from 4,050,060 up to 6,200,060 corpuscles per cabir millimotre; but, the corporcular value estimated in hemoglobin was invariably low—the lowest register being '44 in the case of R. W. J., the other three subjects giving '15, '76, and '79 respectively of the normal value. In the case of M. A. M., however, the numerical corporcular richness, commencing at 2,680,000, fell to 2,040,000, and eventually rose to 35 million corpuscion per millimetre cabe; the corpuscular value at one time being '25 rose to '68 and subsequently fell to '60 and even 45—the latter coincident with a wild maniscal outburst.

Prognosis.-Of the seventy cases, fully fity-six completely recovered at the asylum, whilst four others were discharged "relieved" -heave the recovery-rate reached the favourable percentage of 80. The mortality was 3th per cent, of the whole sixty-eight cases-i.e., six died. On the other hand, four patients (5.7 per cent.) still remain in the asylum as chronic incurable cases of several years' standing. On consulting the recovery-shart it is observed that, up to the account month, but nine cases recover; thence, up to the sixth month; the recoveries rise gradually to an aggregate of thirty-arren; during the following two months, but five cases recover; at the ninth month there is a sudden rise in the recoveries, from which period, up to two years and whalf, a few causal recoveries are still noted. The recovery rate does not, therefore, contrast so favourably as appears in Dr. Clauston's statistics, in which it is stated that in three months over half had recovered, and in nise months 20 per cess, were well. Our own results show that rather more than one-half of the recoveries occurred by the fifth mouth, and an advance of the number of recoveries to forty-four by the end of the sixth menth; whilst, as in Dr. Clouston's cases, 87-5 per cent. Ind recovered by the minth month from the commencement of their insunity. In an admirable summery by Dr. Madeod of a large number of cases of puerperal instaity collected from English and South asylums, the recovery-rate is given at 17-3 per cent, of the total. His statement is as follows:-"Of 814 cases of purperal ineasity, 620 recovered, or 37:3 per cent. Of these 814 cases, 74 died from all causes, giving a mortality rate of 9 per cent." ?

The inculculable advantage of early treatment is very obvious in the recovery-list; since of four-and-twenty who were placed in the mylum within one week of the onset of their insanity, as many as thirteen were recovered within three months, and the remaining eleven left recovered within five months, and this despite the fact that several of

^{*} Asserting serviced blood to be correctly computed at 5,000,000 per cable millimeter.

⁺ Loc ot.

these patients had inherited strong neurotic tendencies; thus, the family records of these twenty-four (early) recoveries testify to the following facts:—

Mother paralysed,	2	theorety is	- 21	months.
Brother insune,		- 10	3	-
Mother insure,			in	
Sister innane; finher a heavy drinker, f		**	24	-
Sifter inniery		200	25	0.0
Grandfather issues and consented minds	14 -	700	2	-71
Father incase,		141	1	- 11
Patien and mother issues (second attack)	100	-	42	
About and two coming theans (second atta-	chi.	6	77	11
Acril Image;		24	4	

Even direct inheritance does not, therefore, seem so strongly to affect the recovery-rate in such cases when placed at an early date under spitable treatment.

Let us now turn from the favourable cases to those in which recovery was protracted to six months and later. It becomes a significant fact that these are cases where asylom treatment has been delerred, and the patient kept under their friends' expervision for a period ranging from two weeks to several months.

Circ		A	Onest promise	61.				Biomyst	Anc
1			A weeks	100		1		7. woodle	29-
2			2 11 1	brother :	10000)		-	7 0	26
3		4	2 _	9 .		1	-	7 10	200
30	-	- 1	3 -		4			7)	25
5		-00	4 11	100	-			W 11	24
18	-	- 1	3 _					B 11	94
7		- 1	2	- 1-	4		-	2) 11	25
8		4	Kwatte.	1 1		0		94	:48:
3	-	- 11	9 11		4	-		9	26
38		11.	2 11					9 00	-21
110		1	3 0		10			41	24
77		-	3		× .		-	41 0	27
13	1	- 1	2 11			0		1111	25
34	10	- 1	3 weeks			-	-	12 11	29
2.5	-	-	2	1 =		0		134 H	22
16	-	-	3 reseries	2 -		4		14	27
17		1.0	2 "				7	2 years	27
18	6	- 1	2					25 14	24
19	4	1	7 weeks	r -	- 7	-	4	6) months	25
20	-		7 -	1	-			41	22
103		- 11	9 - 1	paternal	dered	15)	-	46 11	26
22		- 1	2 _ 1		- 11	1	90	E5 10	12%
22	4	-	4 months	1/2	4		-	b -	126
24		10.	1 .		-1			4 "	26
25	2		25 0	1 1	11.	-		85 H	25

Equally instructive is it to note, that the failures amongst those who

were but portially relieved and so discharged, or who remained as chronic insane, or who anocumbed to a fatal malady were, with very few exceptions, either fate minimizes or core thery years of age. A glance at the following three tables illustrates this point in a very formule manner:—

MORESLITY.

Constituted At	toric.		453.			Sale and Came III Seath.
2 months.			97		(4)	I meetly ; of tolerch.
3 -	1		28		140	fig years of philiness
Secolars	thu.	-	42		in	Thyoare; of general paralysis.
Township;	10		-11	X.	14	I month; of parameter.
1 11			D.	-	in	Smorths; of phthron
31 11			78	7	21	2 years Timertha; of general paralysis,
L'week,			50		1.0	I month; of pelvis reflution
A m	-		36	-	lin'	2 weeks ; of chronic brain strophy.
F 4			-41		14	I week; of pulminary congretion.
1 -			33		116	A moralle ; sents corebritis (father and enabler treates)
10 high			22	1	10	A years of gattered

Dru namen "Berresucc"

On Administra	Age of Parama.	1964-if (Swings).
2 works	39	Byraca.
3 monthly	. 29	- Amerika
Sweeke, .	23	- 2 years and 1 months.
Timelin .	25	- 2 months (father and doubler incare)
Several months,	- 34	. Sj moeths.

REBURERO "CIMOTO DOLLE."

Warreley,	-	4.	24	100	7 years; still in temple.
6 H	-	4	256	14	T strong heredity.
Smooths		4	29	A	Lyer and Smorths.
I week,		9	.20		4 years.
1 4	10		25	19	3 -

In conciumon, then, it may be stated that the inhanity occurring at the purperal period is one of most acute sharacter, yet most favourable as regards the ultimate issue of treatment.

The prognosis will be influenced unive especially by-

- (a) Duration of the symptoms when the jutient is brought under treatment, and
 - (6) Largely by the age of the patient.

If the patient be under thirty, and judicious treatment be employed within a week of the onset, the programs in favourable; every day's delay after this adds to the ultimate risk.

If the patient he ever thirty years of age, and, more especially, or the treatment has been delayed for two weeks or longer, then the recovery if ensured will probably be prolonged, yet the risks of partial empery only will be strongthoused.

Treatment,-Our first enquisies should be directed towards the gunito-arinary system, with the object of discovering any local aterine mischief, whether temlemens upon pulpation, a rising temperature, a history of arrested or fastid lockie, indicate lurking troubles consequent upon labour. The most careful examination should be made with the object of ascertaining any source of peripheral excitation which may be removable or pulliated. A alight perexial movement will generally be found in the acute maniacal attacks following immediately upon parturition. It is always advisable to begin our treatment with a saline aperient, and secure a free evacuation of the bowel; the condition of the breasts may also merit attention. A bland but nutritive and fluid or semi-duid food (including milk, beef-bes, broths, and eggs) should then he given at very regular intervals-forcible feeding being recorted to should the exigencies of the case demand it, and, in fact, this is smally the rule. The condition of the blood would appear to indicate the administration of iron; but, in all these cases of scute excitement, it is well not to give chalybeate preparations until a much later date in the history of the case | at all events, not until the patient takes food sponlaneously and aleeps fairly well, without having recourse to sedatives.

The form of scalative and separate is of importance; bromide saits are of less avail singly than in combination with chloral. The latter is the better drug to rely on in obstinate into min. Paraklehyde has been given with considerable success, and is certainly more efficacious than sulphonal; but, of the three, we give the preference to chloral. Later on, with abutement of maniscal symptoms, it will be well to admirater phosphatic foods, the syrup of the phosphates, or a mixture of the ammunic-citrate of iron along with mult extract.

In later stages, the question of uterme involution is one of much moment—andoubtedly a defective involution has much to do with the persistent excitement of these cases. Here Easton's syrup, the fiquer strycholos, or tineture of nux romics, may be of avail; or the chloride of ammunium near he given with advantage.

Early association with the insure should be avoided, as likely to increase the irritative process going on. The subject should be kept at first confined to her bed, attended by a name, and only when the maniacal excitement is somewhat shated should she be taken into the open air for short walks, or allowed to associate with others similarly demarged. Warm baths may be utilised with advantage during the progress of the case, and by their sid it is possible to ensure sleep in many cases without resorting to the employment of solutions. Maclood wisely insists upon the re-establishment of menstruation during convalenceme as an important element in treatment. "No case can be

considered as cured till the menatruation is regular; above and iron pills, erget and worm hip-baths are indicated. I have found potassium

permanganate pills most useful in this cospect."

Insanity of Pregnancy. - I samity during the period of gestation is remarkable for the infrequency of its occurrence; upon that point all authorities are agreed; Our statistics in large paquer-asylmne certainly corroborate this statement, and, when we deduct the cases admitted subsequent to confinement, but whose mostal ailment definitely dates from a period prior to partirition, and only estimate those who were enceint on admission, we reduce the numbers so for that they are of little or no value for statistical purposes. Eleven cases of invasity occurring during gestation were admitted aggorgan a total of 3,814 female adminsions, or the very low propertion. of 0-6 per cent. , hence our experience with respect to inmustry at this physiological excle is indeed greatly restricted. So great is the repugnance to the admission of such cases, and very naturally to, that undoubtedly many subjects escape asylum supervision, and are sursed through transient attacks of allegation under the gasedianality of their friends at bosse; and, on the other hand, so frequent are the triffing mental adments of the earlier months of pregnancy-the morbid cravings, the emotional and moral perversions-that they are regarded with little concern; whilst a more serious mental ailment may be excused as but an exaggerated expression of the same states. Our very limited experience at the West Riding Asylum would indicate that insanity of this period is by no means more prevalent amongst primipure, for mine of the eleven cases had previously borns children, and in none of these cases had the patient suffered from a provious attack of imanity. Cases have been recorded where every confinement has been preceded by mental disturbance amounting to genuine inunity; but it is much more usual to find such frequent recurrence as the sequel to encousive parturitions, than in the pregman periods of a woman's life.

There is usually a period of mild depression for some time observed see the more acute outlevale of symptoms; nervous timotity is a frequent accompanisem; the patient losses confidence in herself, and dreads that some imaginary evil in about to betall her; she becomes suspectors, and often exhibits want of confidence in her bushased and relatives. All the cases which required removal to the asylum were instances of acute manimal excitement; they were not associated with suparaire emotional states but the reverse. District, timidity were apparent in all; and, at times, terror induced by acute hall-climitions calminated in frequent framied excitement and the wildest conduct. Periods of sallen reserve would alternate with solder outburnts of mania; and the subject was usually watchful, intensely suspicious, and suddenly aggressive. There was in most of the cases a special danger of suicidal arts, attempted usually under the influence of some terrible delucion; as in the case of one patient who selleved herself select by Satan, and who made frantic efforts to leap through a window. The excitement is accompanied by great incoherence; but their morblings usually betray the dominant feelings in frequent reference to blood-shed, wurder, treachery, or the like. The most persistent inscensis often prevails, and destructive tendencies are at first obvious. Later on the patient may have alternations of depression and mild excitement; in which she is flighty, modificeers, treacherous, and prone to vicious conduct.

The larger proportion of cases occurred beyond the stiral month of gentation, and two cases about left the asylum recovered before their confinement. The proportion of "recoveries" amounted to 54.5 per cent., whilst two others left, after a prolonged residence, sufficiently relieved for home treatment; two, beserver, died—one from puerperal fever, and the other of chronic phthisis.

With respect to the origin of the sential devangement we can predicate but little from the seasty figures at our disposal and the history of the few instances afforded us. It was ascertained, however, that strong devolutery predisposition prevailed in 26 per cent. That too other come subsequently died of general paralysis: and that there others, although affording us history of accentral imamity, were considered to be of congestically defective mental organization.

INSANITY AT THE PERIOD OF LACTATION.

Contents - Easis Allewhart open Lactation - Persol of Uterror Irrodution - Persol of Mammary Equitation - Symptoms - Depressing Delesson - Impulsive Nature (M. W.) - Sainide (M. D.) - Jutensity of Manuard Environment - Sexual Personner - Hallecontions - Etiology - Enhancion and the Sequela of Labour - Protracted Uterror Involution - Lactation during Fredomid Assessin - Hyperhamation - Qualification of the Nature Mother - Period for Weating - Prognosis - Trestment

To a certain proportion of the poerperal, the whole period of lactation is one fraught with risks. The period is one of acknowledged susceptibility, and when conjoined to this normal exalitation we have the predisposition suggestered by ancestral instainty, the acquired elements evolved out of victous modes of life, and inattention to the plainest physiological dists, the morbid impetus towards instainty is greatly strengthened. Understoodly, the factor possible to this period of lactation, to which are attributable in part the mental reductions, easy with the physiological changes incident to this period. Thus, in the early period of lactation, the immediate effects of gestation and parturition, or the changes normally amused in the uterus on the completion of labour, are of paramount importance in our estimate of the origin of the mental ailment; and so, throughout the period of uterine involution, the refex irritation from the ovario-uterine apparatus is of primary importance. As, however, aterine involution becomes complete, so the activity of the manimary secretion assesses an increming importance in its effects upon the economy; in lieu of refer caritations from the uterine surface, or of the faults arising from defective deparation, the matrition of the nerve-centre becomes more directly involved.

To attempt, however, to distinguish betwint the imanity incident to these periods as distinct nosological entities would be highly inconsistent, and not justified by a scientific estimate of the relative value of symptomatic indications. The insanity of the parturient and early purporal stage imperceptibly glides into that which dismeterises the later stages of lactation; and none but an arbitrary division can be assigned (for convenience in study) as the termination of sterine involution. Then, again, the completion of involution is an excertain period, variously assigned by different suttorities. One mouth is given as the term in healthy subjects, under good bygienic surroundings; air works is the accepted time in Continental Lying-in-Hospitals (Burses 6); whilst Tylor Smith ? quotes fee or even these mouths as the probable period. We may, however, accept six works alter partorities as the period when the aterus and searies are pussing into the quiescent stage, during which lactation assumes its own important vice. It is highly essential that we should clearly recognise this overlapping of physiological stages, as thereby are explained certain exceptional cases which occur about the transition-period here alluded to.

Symptoms,—The prevailing condition at this period as, in fact, that of an scate psychosis, in which excitement presonninates, and in which tearlying ballicimations (visual and aural, or combinations of these) lead up to various sichnisms notions, and in which suspicion of friends, relatives, and neighbours is prominent; fears of supernatural agency are not infrequenc, strange phantasms haunt the eye, reysterious whaperings, unexplained sounds, or more definite voices issue in the morbid imagery of angels or ministers of shrkness. The loss of self-confidence begets the frequent notion that the "soul is lost," or that all future good is sacrificed by some imagined crimes committed. The moral being his its nitimate formulations shoken, and confidence is lost even in those who should be nearest and dearest to the afflicted one; the lumband's fidelity is openly challenged; intrigues of sequalintament dreaded; the food declared to be policized.

T DAMES AN WOMON, IN 460.

The onset may be sudden; it is far more frequently preceded by mild depression. The patient becomes reatless, irritable, variable in mood, suspicious of her friends, impatient and fretful; she is apt to minimterpret the conduct, gentures, and words of others. Then come fifful outbursts of anger, extravagant accusations, or actual violence, and the onset of genume manuscal symptoms. Incommis usually prevails; noisy, hoisternus, incoherent muchlings ensue, in which the patient gives atterance to frequentary sentences from which we glean the condition of mind to be one of district, suspicion, or terror, or to be dominated by annal hallocinations.

The delusional notions vary from time to time, and periods of scalitation alternate with mental pain, rising even to the pitch of acute melancholla. Such subjects novally come under our notice in asyluma, looking exceedingly pallid from anima, restaced, thus, and juiced from continued aleeplessness and excitement. In this stage of excitement, they are often dangerously impulsive, and require most careful watching. Thus, one of our patients, who had suckled her infinit upto the tweifth month, although much enfectived in health, became suddenly maximal of home; she struck her husband on the head with a poker, ran a darning needle into his side, and eventually get possession of a knife at night and grated his throat ere she could be secured.

M. W., agod thirty one; mispied, and the mother of three shiftens. Further inhercool instality from the mother, who was an installed of this asylom twenty years
ago after continuous. The pattern was continued twelve securits prior to admission,
and had brought the infant up at the brunit until four months start, when depression first supervised. For health larger to fail, noticement, line aparts, as inhibbedrage, and the definition that her mail was best, that the dealt was in her leaves,
and that all her friends had become her seemies, sharacterised this period.
She had infered from continuod traccurie. Patient had been of temperate
habits.

She was communicative upon admission, and discounsed readily upon the nabject of her mortal admests. Ever since wraning the child size had been deprecial, filled with murbid fascies, frequently fair tempted to injure hereit, had her all control, and justom ribedly observed) would certainly have nectroyed hereit. Had found her memory much impaired of late, and this had troubled her groundy; she had also taken a deep-rooted distinct to her home, because the fastised that a friend who thred apparets was constantly watching her. Admitted that the behind derived on to to too, and felt pieceup to dequest. The estaments had been regular and termal became must be. Cod liver oil sandains ordered, and a mixture recetaining 10 min. of fig., upit, and a constant malpharts and those times shilly.

From this date she made a steady progressive improvement, although restinual nights, and suspinious of the patients with whom the was associated; she was usually given to broading and introspection, but recovered sufficiently to surpley havelf as homehold comparisons within two months of her administrate the anylons. These came a relapse with subfine excepted inputies, and it is noted. Nevermber 2nd — "This marriage, when coupleyed in the while female officer's bedraces, she was magin in the act of suppositing hereoff in the bedracit by the bindersed."

She was again placed under opions treatment, which had been discentiated for a time, and from this date cowards physical and montal improvement continued, and she was discharged recovered, after a residence of eight and a half number.

Another young girl in the sixth month of numing was admitted in a state of rambling incoherence, flighty, stratic, and given to silly laughter; reduced in health, and amends, with a hemic bruit. She stolently associted her nother, and nearly succeeded in throttling her father, whose identity she appears to have mistaken.

Others make equally determined attempts upon their own life, as in the case of a poor weakly woman, who, struggling against the odds of penury, had been suckling other opticals besides her own for a period of twelve months with harely a subsectence diet. Upon admission she made a most desperate attempt to drown herself in a bath in which she was placed, thereby struggling with the nurse in her efforts to keep her head under water.

M. D., aged thirty-two, married, and the mother of three chibben, showed her first symptoms of mental alemation four weeks prior to admission. Four mouths before this date sho gave both to twice, and had embled both up to the present time. The history testifies to great depression, with attacks of intense and prolonged crustement, with incoherent raving, and cadent aggressive conduct. She had bequestly threatened to take her own life, and had once tried to out for threat. The family history was debettive, but as sent is stated to have died in an arrhum.

On administra (Ger. 18th) the was few, despendent, and emotional paperalisms and discontented. She converted readily upon the subject of her depression, and microsted here significant left low and depressed, even back to the early months of proposacy, when also used to visit a single-boar's farm, where there was a great black dog; when she became more despendent six developed the delayion that her child would be like a dog. She was in this time very thin and deligate; the complexion amounts and blanched, the eyes sunfers with dark pagmented areals around. The breasts were exciten, distended with marsting, and tender. Oftens notes was at once administrated, and belladous limitatest applied to the breasts. The pittent was ordered full extra dist and obleval, if measure, at night.

A week later, she was greatly depressed; stated that she had suffered when at home from impulse to 200 for children, but densed this fact to the shears. Size new reports this artifice as a great six for which she cannot be forgress.

Not let the most determinedly animini, and disoplem at pight. Last pight size for up her sizest and attempted strongeristion, and this morning repeated the attempt with her appearating. Expresses for determination to dis. Timel. eps., mine axx., ter-dis.

Nor 27th .- To day extempted to recillest a needle, which become impacted in the pharyon, and was removed with some difficulty.

Nor. 289.—It was discovered by the appearance of auxiliary and stations of the neck, that she had also on the 27th insected a darwing specific there; the was specificated on the point, and admitted the net. There was no mark in the skin, but by pressure on the appearance side of the neck a preminence could be felt over the left sterao-massical mesoic, purt in front of the enternal jugalar. It was cut storm upon, and a large daysing receile removed.

Inc. 16th.-After dight impressment has again become desperately satisful.)

tries to choke terrell by anything she can by hands upon, and comtactly sorks to obtain seedles by steadth.

Dec. 18th.—This rearring a sharp projection like the lead of a secule was felt beneath the skin on the right side of the mek, about the middle of the sterm-teasted. An unsuccessful attempt at renoval was made, owing to be desperate struggling to present it. On the 28th inst., the prominence was again felt, and a secule as inch and a ball to length removed. She is will growly depressed and selected.

Then inflowe as account of perchasio, during the course of which to foreign body was detected by external polyation; but the patient rapidly necessaries to the attack, and died on the 16th of January. A post-movies examination we libited a localised percential, the code of small intention being matted together by a considerable amount of lymph and puralent ensternal, the large local had comped implication. Slight electricity points, with potches of returns congestion, were revealed along the jepanous and dissilience, better which was a purelent collection in which a mostle 11 inch long lay substitled. There other needles seen fained in the substance of the mountary, and one in the toward of the work; more were present in the stemach or intention. In the stemach was a piece of charmed wood, 31 inches in length by short 1 in the charmes.

A similarly enfectived, exampline, nursing mother, reduced by seven former pregnancies and nursings during the period of ten years—the first accompanied by pursperal convolutions, and each subsequent possperane followed by severe headsche and symptoms of exhaustion—ctill persists in nursing, despite four months' warning of steady progressive enfectboness. In a state of acute melancholia so induced, she sushed off one morning with the intention of throwing herself into the river-Nidd, but was arrested in the act by the "uniden remembrance of her child at home;" she returned home, and next day swallowed a large quantity of landarous."

The character of the maniacal state is especially one of Intensity. It is essentially an owns mania with or without hallocinations; but, yet, it is distinguished from the etill more intense excitement of the early purposal alienation, just as ordinary neutromania is distinguished from the furer of epilepsy. The processed form is peculiarly proce to wild, impulsive, indiscriminate conduct, as the autoons of very extreme reductions; it is peculiarly a convulsive affection, as in epilepsic furer; but such profound reductions do not present themselves in the mania of early laxuation. Occasionally, but very rarely, acute delirious mania may occur, as in the following case:—

5. M., aged thirty case, married twelve must be ago, and delivered of her first shald three married below her admission. The labour had been natural, but her health, processely reduced, had become programmely worse, and she had been wholly incorpable of attending to any household daties. Still she matted has referred at the breast, and protected in doing so metil four days ago, when sudden and reterms

^{*}The assertal proposately was utilizened in 20 8 per cent. Of our cases; important midens to other in 20 per cent. The subjects of pursperal immutity gave the lower estimates of 25 per cent, and 47 per cent, respectively.

minimal verification supersecol. No predisposition was discoverable, and the family bistory was around to be free from insenty, epilepsy, or apoplexy. The parents were last biving and buildly. There was no moral element irreduced in the caraction. On administrative was found considerably reduced, pale, freely, tremplets; the pupils wiskly distord; there was great insents; if the beautit some reconsiderably distorded. She was in a state of the utiliset environment, abelianely involves, and untury oblivious to the nature of her surroundings. No rational or even conserved reply could be obtained from her, but the scenariously regented a word size had benefit intered just before. She was almost incommently resulting, and could with difficulty be kept in hed. At home size had obtained no sleep, and personately refused food sizes has attack. Abundant aroung neuralinear, with saturated boot, was ordered, and half-discoins does of children to be given at hed-time.

Forwantely, she task too food readily, and the first draught processed her a little sitespe. For four days she contracted in a state of acute delermon reason, quite involvement, and extremely prostrate, the tanger dry and council, the lique constant with scatter. She then become communicated advantage of our days was able to sating in the day rows, being fairly spiret and manageable. It was not read its reservice had slapared from his adaptation that the nature is over recentablished, often which the particular provide symptoms publish consisted of every slight emittered, improve, and recommodale arrestability) passed off entirely; and in a few reads she left recovered.

The intensity of excitement is accompanied in these cases by great incoherence and much motor agitation; but, in many instances, the patient is dominated by delusions, is reticent, evenine, ampicious, yet watchful, and (as already affirmed) dangerously impulsive.

The deimional conceptions are strikingly similar to those found in the early purspend weeks, when, as we have seen, the idea of eternal punishment of the last well, of ruin and misfortune to self and family, of persecution at the hands of husband or neighbours, are the more prevalent perversions; the idea of poisoning is less frequently expressed in the innanty of the pumperal months than at this period.

In a small amounty of these forms of alienation, exalted notions are apparent. They are usually evolved out of religious conceptions, the policies falls into contaits states, clarge ber hands and is wrapt in prayer, or, maybe, believes hereif to be Christ. With mob originus delectors, however, far more frequently prevail electre notions of demoniacal agency; the black-art or witchcraft is by no means an unfrequent form of explanation given. Thus, one of our patients believed hereif benefithed, and called hereif the "samplet woman of Revelation;" another believed hereif and husband were hewitched by the serceries of her neighbours, whom she constantly saw peoping at her through the windows, and whose voices as constantly intimidated her; and yet another accurate her neighbours of embering her room, "crossing bur furniture, and so putting all things wrong."

The sexual condition, if not apparent in a directly-expressed

delinsion, is often manifest in the patient's behaviour, indelinery, obscene eratic language or gesture; but sexual delusions and halincinations are by no arrans infrequent. The sevulation to husband and children often prompts to violence; one peer woman whose case we recall, publicly discovered her child, and then attempted to mosther it. Of sixty-six cases recorded of "lactational invanity," forty-sixi.s., 60 6 per cent.—had delusions.

Hallucinations of the special senses were expressed in twenty-two (338 per cent.) of our cases; and, hence, were of more frequent occurrence than in ordinary prosperal intanity. Visual and sural may occur separately or conjointly; but the prevalence of the cared was notably greater and more pronounced, even when both senses were affected. They were always of a depressing and poinful nature; and many of the delusional notions referred to were based thereupon.

The vivid nature of such creations, the enfectived frame of the patient, the complete loss of self-assurance, and the resulting anguish induced, produce a picture which strongly emists our sympathies, and is poinful to witness. Thus one of our patients is surrounded by spiritual beings—angels—fiends—who tell her that her soul is danued; another is tortured by abusive spithets continually shouted to her down the chimney; another hears the toying of furious dogs, and sees her children killed before her eyes. In their intrinsic nature, therefore, these ballucinations are similar to those of purposed insanity.

Upon analysing the various forms of alienation from which our sixtysix cases suffered, we find them, as contrasted with the prosperal cases, distributed as follows:—

Forms of Nicolai, Addison					Sa	Amirote	Propest.
Simplements:		0.1	4			0	1
Acute	-	-			140	35	20
Acute delicious marie,	-				4	1	-441
Mania with prominent didne	duzy.		- 4	- 4	(4)	11	17
Reserved music.	00		- 4	-	-	3.	
Demontia with curitiesents			- 1		-	1	-
Stanic resistanticità.	-	-		-			7.
Acute is	*	4	4			3	1
Melancialia with provinces	dela	CHRIST	4 4			17	34
Melinenoly with stupor,	-	141		- 4			
General paralysis,			4			2	
Congenital mental defect.	000			- 8	-	1	
						60	69

It is clearly apparent, then, that at both periods excitement prodeminates over depression, and a larger proportion of scute maniscal attacks characterise the pumperal period. On the other hand, acute depression (melancholis agitans) is rarely net with, whilst melancholy with delunions is frequent at both periods. Excitement in the Early Months.—The more scute forms of excitement presail within the first three months following partnersion and the delasions of persecution and associated gloon and despondency of maisrcholia, predominate where mental symptoms first betrayed themselves air months or more offer follows. Thus, of twenty oven cases where alienation occurred within the first six months, these were eight cases of melancholia to seventeen of munia; whereas, in twenty-nersh cases, between six and twelve months subsequent to labour, there were ten of depression to fourteen of excitoment; and, later still—after twelve months—there were but eleven cases, i.e., seven of depression and four of maniscal excitoment.

Etiology.—It is highly conducive to the correct appreciation of these forms of mental disturbance that we keep in view the numerous factors which may operate as exciting causes of the attack; we are not dealing in the majority of our cases with a simple oppray, such as hyperfactation; we have to consider not only the peculiar mental temperament and physique of the nursing motion, but also the series of accidents which may have occurred before, at, or samequent to-labour, and their often far-reaching results; we have to bear in mind the possible divergence from normal physiological reserious of the outeris-oterine system, as well as the prolongation of suckling beyond the limits which the mother's bealth will stand, the deprivation of food which penary may entail, and the long list of moral agencies which poverty and wretchedness so frequently call up. Amongst the more important of this category of causes are:—

- 1. Severe protructed labour with instrumental delivery.
- Serious port-percon homorrhage, or the flooding occurring before or foring labour.
- 3. Protracted or arrested attends irrelation.
- 4. Lactation where professed assemb already emits.
- 3. Lactation continued after the appearance of general mountains.
- 5. Hyperfactation.

Exhaustion and Sequelæ of Labour.—As regards the first two causes (which give rise more frequently to mental alienation at an earlier period)—the so-called purposed insanity—it is but what we should expect that the attendant exhaustion or anxum, if it does not at once issue in mental derangement, will so result if the tax of histation be severe; and as illustrating this we append the following from the prior history of a few cases of insanity during lactation occurring over any weeks ofter labour:—

- Case L. Primipura, labour very pressuated and server.
 - 2. Instrumental delivery, where post-parties bemorrhage.
 - 3. Protracted labour, profess hamorrhage,
 - .. 4. Instrumental delivery, profess flooding, philogenesis.
 - . A. Very secret pull parties formerlage.

Case 6. Severe flooding during gentation, monorthagis at all extremenal periods, profound assesses.

.. T. Menorchagus at all monthly periods a profound assertion

In the foregoing series, it will be observed, one case alone was that of a principarous subject; and, in fact, inamity during loctation is infrequent after first confinements. In the immuty occurring at, or shortly following, labour (puorperal inumity), primipare play a far store important part; 32-3 per cent, of such cases being first confinements. The insenity occurring during lactation presents us with but 10-6 per cent, as primiparous subjects.*

Uterine Involution,—We have strong remains for suspecting that defective interine involution plays a most important side in the earlier cases of instational instanty; and it is to this cause we may often attribute the preponderance of excitement over depression in the earlier months of lactation. The eyler nature of the neurosis closely approximates to that which we know to be largely dependent upon the direct agency of a gravid or parturient interes; and the results of treatment, moreover, directed towards this condition, warrant us in assuming protracted involution as being a large factor in these earlier weeks of lactation.

Suckling in a stage of cerebral exhaustion is, perhaps, of all causes the source of the more severe and prolonged insanity at this period. It is by no means uncommon to find mothers suckling their infants several months after the appearance of indubitable indications of profound cerebral decangement, loss of memory and attention, merbid feelings and desires, bullscinations of sight and especially of hearing, complete change of disposition—yet the infatuated patient clings to the habit, and will say, as one of our poor patients did to her medical attendant—"I cannot give up the child, but it will drive me mad." We need only glance at the accompanying table, abstracted from the history of sixty-five cases of insanity during factation, to have enforced in our minds the importance, as an etiological factor, of such virious persistence despite failing vigour, progressive massuis, and even well-marked mental disturbance.

Com

- 1. Suckled solube size mouths, and for two or three weeks indulying insunc-
- indast seven months, and for several weeks had been biding in health, and siding monthly.
- 1. . several other infacts, as well as her own, during the year.
- 4. ... indicat nine countly, whilst extremely delicate and to feeble health,
- 3. ____ child for four years, and had always included in prolonged tainatum.
- & ... infant fear months, although for yours depressed.
- ". ... infant fifteen morning last those months throng absention.

Ches.

 Sackfed infact elever months, yet possible and deraged throughout the whole period of lactation.

5. Infant nine months, yet for these months distinctly derauged in mind.

10. Infant to months; accord upons correlation three months after

conferences.

11. ... infant four mouths, yet has been immediat two years.

12. .. infant ben months; in very feeble health and deranged of fave,

infant, while becoming for four months part simelly and programically referbled and blanched from anomia.

14 ... inbut now months and a half, although for three months derarged.

15. .. infant also months, yet depressed for years.

16. .. twiss four months, yet for our month denauged in mind,

Injudicious nursing, therefore, plays a very important part in the cassation of many of these cases of insanity; but in all such cases alike, it is to be noted that cerebral malnutration from anomia, whether induced by hyperfactation, by copious homograhages, by the carboxy of intercurrent fevers, by phthisis, or causes associated with semi-starvation, arouses the self-name form of mental anomaly.

To supply the wants of the infant with a food sufficient in quantity and of proper quality, the nutritive processes of the mother and tissuenetatelien unit maintain a well-regulated talance. The mammary secretion requires not only secharine and fatty, but nitrogenous materials in certain due proportions, and this demand is made upon the blood-current of the gland. The relative amount of circulating albumon and earbo-hydrates in the blood is apt to be powerfully affected by many agencies, apart from the actual amount introduced by the food. Should the respiratory function to diministed or retarded, as by living in baily-ventilated, overheated rooms, the carbo-hydrates must accumulate in the blood current, and tend to be deposited more largely in the tions; the same result must across in anomic states where the exprescarriers—the red corporcies—leasted in numbers, fail to exidise the hydrocurbons circulating in the blood. In the nursing-mother the accumulation of hydrocarbon thus brought about must issue, more or less, in a relatively-increased amount of fatty matters in the wilk (as, for metance, occurs in stall fed unimals). On the other hand, should frequent exposure to cold stimulate the respiratory functions and expression proceed more vigorously, the hydrocurbons are diminished and the percein-compounds undergo a relative increase, so that the malk contains more casein, whilst the fats decrease. If each muscular exertion be demanded the protein metabolism recreases and appears directly to affect the composition of the milk, increasing its casein." The same result occurs in animals; it is found that the excretion of

Thus we are cold that the cuttle expressed to cold and much passential receiving in Switzerland yield a very small quantity of batter, but an exceedily large proportion of classes. —Companies's Physiology, p. 615.

ores is increased, and carbonic acid diminished; in other words, postein sattabelian is increased and fat metabolism lessened. It is, therefore, obvious that a due proportion of nitrogenous and hydrocarbonsecous constituents in the blood, regulated by a rational diet and by the normal metabolic changes occurring in the tissues, is an all-important feature in healthy lactation; yet the function itself may be profoundly disturbed by a vicious system of sackling. Thus bequent application. of the infant to the breast not only stimulates the secretion of milk, but also modifies its quality. The quantity is largely augmented, and the milk becomes much ricker in casein; hence a serious drain from the albuminous constituents of the blood is reconioned and anemia. results. In the pursing-nother an accumulation of storage fat appears to occur, reminding one of the condition of hybernating animals, in which, during a prolonged winter's alone, the entire absence of food requires (despite the constion of activity and the extremely lowered respiratory and heat processes) a large storage of fat to supply the slow, though continuous, waste. So in the nume, the waste occurring through the mammary secretion appears to demand a fat-storage both for the maintenance of such a secretice and the respiratory functions; the early menths of lactation are consequently marked by the plumpness of the body generally-healthy nursing mothers almost invariably "put on fat" at this time of life; and it is only late on in lactation, when the system begins to appreciate a serious drain, that the rotundity of the figure leasens (Trousseau). It is a condition of serious moment when we find the nume not so prepared for her architect functions, and it is a notable fact that, in a very large proportion of cases of insanity occurring during lastation, this symptom of ominous significance is recorded. It should always he accepted as a note of warning in those who are profisposed to imanity, or who have afforded evidence of cerebral malnetrition. Such failings are usually due to injudicious nursing; and injudicious marsing is at the root of most of the cases of aberration. occurring during lactation. It is not so much prelenged factation as over-indulgence, often of a strong, robust infant, whilst the nurse is in a delicate state of health. If we consult our statistics we find that, out of sixty-five man, twenty-seven had suckled but six mostle, and twenty seven others had suckled up to the ninth and twelfth menths; obviously, then, pretracted suckling had not so much to do with the cause as other factors.

What occurs is this, a woman in delicate health, often after numerous rapidly succeeding confinements, or perhaps after a tedious prorperum, or, maybe, lacenterlage before or during labour, suckles her infant with injudicious frequency, seedifices her rest night after night, and probably taken insufficient or unsuitable nutrishment. The constant drain from her system and loss of rest engender anemic and dyspeptic symptoms, still less favouring the restoration of the material last from her blood. The superficial fat disappears to supply the demands of the exhaustive secretion. The carbohydrates, rapidle diminished, no longer can exert that protective influence over protein metabolism (Landois and Stirling *), and a further waste occurs in this direction-first, the circulating albumoufeels the drain, and later, the organised albumon must still further sid in the formation of the fatty principles required. In this way, as in all cases where a similar drain upon the system occurs fleurorrhou, diarrhou, profess suppuration), assemia of profound character supervenes; our patient comes before us with pullid face, with blanched lips, with small feeble pulse, the heart's moscle exhausted, and the breathing often burried and punting, and the muscles of the limbs flabby and ill-nourished; she complains of bewlathe, vertigo, dimness of vision, lassitude and arbing limbs. In lieu of the fresh coloured healthy glow of the sheeks, the plumpness and fireness of tiesue, indicative of active functionising and vigorous health, the menual shis and flow of lively emotion, and worm interest in the nursling, which characterise the good efficient nurse, we have a miserably pallid wasted object, half-starved, querulous, full of imaginary ailments, toementing fears, and merbid auspictons.

Despite all these symptoms, some women will still pensist in suckling their offspring from misquided maternal instincts, and often with the object of deferring a subsequent conception; the hydramic state of the blood results in a slow and aloggish circulation, and in the spienic pulp, and especially the portal circulation of the liver, it as in the marrow of home, such aloggish flow favours the distructive homolytic action which goes on here—the red corpuseles are rapidly disintegrated (Quincits).

Although it has been demonstrated that in inautition, the central nervous-system loses in weight more slowly than almost all tissues and organs (with the exception of the spices, kidneys, and heart), and

[&]quot;It must be remembered that only part of the fat is derived from the fixed directly; the rest is a product of a splitting up of proteids in tissue metabolisms (Landon and Stelling's Houses Physiology, p. 218).

I Then, also, we must remember that her Cutt shows, although in ordinary health a large amount of arculating alleanes in spix on, while the organic albumen of the organs and tissues continues comparationly stable r yet, in certain pathological stabus, the organic albumen becoming very martable may assisting rapid disintegration, at in fevers, &c. (Stating, ep. cit., vol. 1., p. 206.)

The liver is reported as one of the chief sites of homolysis "because talepigments are formed from homoglobia, and the blood of the bepatic van contains heavy red corposcles than the blood of the portal even" (Stirling, ep. cit., val. 1., p. 17).

incomparably less than the fat, muscles, and even bases (see V. Voix's experiments quoted by Landois, p. 514), yet, the brain is undestroofly the segan which earliest registers any disturbance in its natrition. This is what we might expect; since, being the custodian of all organic impressions, to which is relegated the function of giving the alarm when the activity of other organs is disturbed, it is highly accessary that its own welfare when threatened should be expressed with no uncertain cry.

What is the proper time for messsing? The period is, of course, a most variable and uncertain time; each individual case must be judged upon its own merits, and in considering, as we are compelled to do, the interests of both parties, the mother and offspring, the question necessarily becomes peculiarly trying and delicate, owing to the fact that the immediate interest of the one often appears antagonistic to that of the other. Ultimately we know that, if the nume anckle beyond her strength, the result will prove highly prejudicial to both, yet, the infant's health may be such that artificial feeding is inschnissible and urgently demands breast-malk of a quantity and quality beyond the mother's capability to supply. Undoubtedly, natural feeding at the breast should be adopted in all cases where the health of the nurse is not seriously imperilled, and when the breasts supply a due assessed of nourishment for the infant's wants; as, hereby, the well-being of both is best secured; but, when the licted secretion is seastly, or its quality such as to render it unsuitable in the case of a weakly infant, to whom artificial feeding might prove a greater peril, the balancing of edds is often a difficult matter. Consistently with the mother's health, every effort must be made to bring up the child at the breast, over the more eventful dentition crisis through which it has to pass, and this might be oftener done by weakly nurses if the regard were paid to a judicious course of anciding and avaidance of errors so notoriously frequent.

The shild has to be adscated into a regular system of feeding; and this should be so managed, that the mother may secure a prolonged rest and sleep at night, and the injurious habit avoided of indulging at night every passionate outcry by application to the breast.

The rule given by Troussess holds good for most cases where we deal with a healthy name—viz, that the period of lastation to extended in most cases over the period of evolution of the canine tooth.

O'My pule, provided there be no serious statacles to surmous, other than the widow of the family, is not in wear the child until after the complete evolution of the carries teeth, which is prescully a more difficult process than the evolution of the motors or first unions. My rule, therefore, is to wait, inverportive of age, till the inhest has sixteen teeth."

^{*} Trouson, sp. cil., rol. in., p. 163

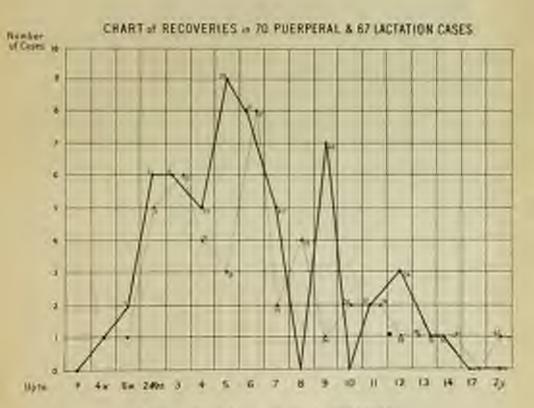
Of course any such rule falls short in its application to cases such as we are now considering. The welfare of the mother, if of newrotic inheritance, and oxhibiting suscitation and amemia in the early months of lastation, is so greatly threatened as to demand the immediate consistency of nursing.

Prognosis.—The recovery-rate appears to be directly affected by the date subsequent to parturition at which the insanity appears; the envisor the symptoms of mental alienation occur, the more forcurable in the insue likely to be. Hence, the recovery-rate is higher for pureperal cases—that is, cases arising within six weeks of confinement, than during later location, as 80 per cent is to 65 6 per cent. The percentage of recoveries for the whole number of female cases of insanity was 446, so that the percentage of 65 5 represents a very favourable rate of recovery, and justifies a good prognosis, although of a less favourable nature than in peerperal insanity. (Chert C.)

If a chart of recoveries in purperal and lactational forms by comtrasted a notable uniformity is recognised throughout, the largest number of recoveries in both tenarring at the fifth or sixth months and rapidly declining in the subsequent period. At the minth month of puerporal females, however, a remarkable rise again occurs in the recoverion of seven cases, somewhat paralleled by a less conspicuous rise at the eighth month in lectational cases. Whatever be the curse of these wave-like recurrence of cases, it is obvious that the periods at which the recoveries chiefly tend to occur in both series of cases are from two to three, from five to six, and, again, from eight to nine menths from the ouset of the disease. Age exercises less apparent influence upon the number of occurring cases than upon the enture of the amount and so indirectly affects the issue. The influence of age upon insanity occurring during suckling, in a series of sixty-five cases where the age was definitely given, may be illustrated by the following table :-

Age	Burnerel	Estimat	Diet	Remained Chrusic	Total.
From 15 to 20.	100.791				1
ii 38 to 83	9	- 2	2		13
25 to 30	10	3	1	4	-21
50 6 / 27	13	1	3.	3	29
_ B54s 46	0	1	2		11
a0.1±45	100		1:00	PI	1
			-		
	43	T	- 9	16	GS:

If we compute as failures the fatal and chronic cases, it will be observed that the ratio of these intravourable cases stendily augments towards the age of firty, increasing from one-sixth of the whole at the age of twenty, to one-their at the age of forty. The large proportion of cases of insunity appear from the total column in the above table to



NOTE Black Line indicates the PUERPERAL LACTATIONAL FORMS.

ANALYSIS OF RESULTS

Recovered Relieved Died Chronic Paerperal 56 arabhi 4or 5.7% 6 arabhi 4or 5.7% Cartational 84 ar 65.6% 6 arabhi 8 ar 12.% 8 ar 12.4%



have occurred between the ages of twenty-ave and thirty-five. We find, moreover, that the proportion of maniscal to depressed, melanchalic subjects is far greater at the earlier uge of twenty to twenty-five, and programically bearens until, at forty, excitement and depression prevail in about the same relative frequency. It would thus appear, at first eight, that youth is favoured as regards greater immunity from ench affectious; in the attack being more acute, and hence more favourable; and to the altimate issue in recovery. This would not, however, express the case testifully, since the proportion of married women in the population of our asylum-district between the ages of twenty and twenty-five is considerably below the married population of the following decennial period of life. In fact, between the ages of twenty-five and thirty-five, the population is nearly 122,000 as against 37,560 who are from twenty to twenty-five years of age; this represents a satis of 3 246 to 1. Taking, therefore, into consideration this fact, that the number of married women in the West Riding between the ages of twenty-five and thirty-five is more than triple that of the married from twenty to twenty-five years of age, it is seen that the younger class do not share an immunity from the ills attendant on lactation; the incidence of inamity at these ages being almost identical, That depression prevails in the later quinquentials and that undayourable results multiply disproportionately may be regarded as established, so far as these statistics lead us to infer. A fatal incue in these cases of insanity fluring lactation is not to be foured apart from the complication with other affections, especially the pathinizal tendency, which is peone to declare itself at this epoch; more than half the deaths were due to this cause in our awa matistics, two others issued in general paralysis, and the remaining fatal case was one of suicide, already recombed.

Treatment,—In most instances our patient's bodily condition claims the chief attention; her strength must be named and supported by every possible measure. Should the breads be bunid, we must treat that condition by the employment of belladorns inunctions, by atropine internally, by local friction, and by gentle saline laxatives. A general tonic regimen must be from the first enforced. The food should be liberal, nutritive, and easy of digestion; for errors, digestive and assimilative, are almost of constant occurrence in such cases. The personned and posserestived preparations, and symine in intestinal decangement, may be utilised with advantage, more especially if we endeavour to associate therewith conditive oil and malt extractives.

Combinations of iron with arsenic, or with other mineral nervine tonics, are especially useful, and the physical improvement so induced is usually accompanied by a decided mental reinstatement—depression abates, and a bealthles cone prevails. The sulphate of iron, in combination with alcotic purgatives as a pill, is a useful renedy for the constitution associated with the hepatic end intestinal torpor of some of these cases; cascars sagrada may also be given here with advantage alone, or, better still, in combination with econymin. Shower-baths, cold spinal douches, and open-air exercise are applicable in most instances. It is not, as a rule, advisable to adopt addative treatment, except in the more intense forms of depression, when surphin given orisontaneously, or the figure opin, will prove the more useful drugs; we should trust far more to general hygienic means for restoring time to the system, improving the appetite, and the digestive and assimilative powers, and for inducing sleep.

INSANITY AT THE CLIMACTERIC EPOCH.

Contents — Symptom — A. Schaute Deliarousi Melanticlis — Sciental Tendency S. H. — Nyephomana (A. A.) — Endogy — Leidence of Tanadiy at different ages in 4955 cases—Influence of the Characteric—The Psychological Transbranches of the Epoch—Instructor Actions—The "Trans-dence" in Propners — Alcoholies and the Characteric—Treatment.

Symptoms.—The mental ailment weak frequent at this period in somen is an affective insanity, in which gloom and despendency are associated with puralysed energies, indecision, and volitional inactivity; a condition pertaining to melancholic states at all periods of life; yet, the poculiar character of the psychosis is the frequency of religious despendency, and delusions respecting the moral well-being of the subject. The symptoms grow in screenty; suicidal feelings become prevalent; and the delusion that the soul is lost often creates fits of mental again; or despair.³⁵

At its early evolution painful mental states invariably prevail, and in over 05 per cent, of our cases mental depression existed throughout the situack—a subscribe delusional melancholin being far the more frequent form; yet maniacal states are by no means unfrequent, and outbursts of excitement, alternating with depression, are proze to occur at a later stage of its history. Someorial anomalies early arise and are strangely tinctured by the prevailing emotional gloom. The spiritscorid is the subject-matter of her broadings; mystic communications are received from above suncunoing her lopeless face, or threatening terrible judgments; or supernatural agents appear visibly and terrify her in her half-waking moments. Visual and aural half-reignitions

[&]quot;Thus Dr. Note characterised the alteration or carring at this period of life as:—

A memorania of four, despendency, remove, hopelmoness, passing or asimally into feweratio."

occur in about the same proportion of cases, 27 per cent, of the whole series being subject to such anomalies; whilst evidence of the implication of other special senses was very rarely obtained. Intellectual perversions soon ensure, sometimes evolved out of the sensorial disturbances, after independent of such states, but invariably intensified by hallmonatory and illusional phenomena when present. Delmional states were recognised in 75 per cent., and out of a total of sixty-out deleded cases, sixteen were victims to the terrible delinston that the soul was sternally lost, and that the subject was to be consigned to the flames of hell. It is strange to witness the prevalence of this religious despendency at a period where, as we are aware, the generative organs are undergoing an important oveligal transformation; and to mutrast it with the converse states of religious exaltation so frequently associated with the sexual transformations and excitation of adolescence, of hysterical and epileptic forms of insurity. Usually the victim of this allment accuses herself of the most beloom cropes, and dreads the pursuit of human or spiritual beings who thirst for her life's blood; but, at times, a case presents a somewhat different charactor of delunive belief; thus, one subject believed herself to be bitten by venomens tooks, that does pursued her and sucked her blood; whilst another declared she was fed on human flesh. Such deliriousconcepts are by no means frequent in this form of invenity, nor are the patient's children or husband usually the theme of her perverted imagination.

Such gloomy forebodings of coming evil or the mental disquiet aroused by a sense of her irrevocable doors, eventually issue in suicidal promptings, in fact, a large proportion from admit this tendency. We find that of all the cases of mental depression taken together quite 60 per cent, are actually suicidal; but, of the class of patients now under consideration, about 44 per cent, only could be so considered. Impulses to enioble are certainly not so frequent yet, in the worst cases, they do present themselves. Dr. Clouston expresses the opinion that :- "The very last of outrage and vigent of will operate against any effectual attempts at minite"; yet experience teaches that in the worst forms most desperate attempts are sensionally made with the object of cluding the terture to which the mind is at times subjected by the terror of impending evil. Thus one poor victim of each terrors imagined herself treated by evil spirits, who audibly told her she was to be burnt alive, and, consequently, she made a desperate attempt at hanging beneff; another ettempted strangulation under the impression of being pursued by the evil one; a third attempts poisoning with vermin-powder, upon the assumption that also was "cast off by God"; and three others attempt to end their misery by drawning, chaking, or the knife, under the influence of similar percented sensorial states. Especially have we learnt to dread the impulsiveness of depression at the climacteric when associated with the tendency to drink heavily.* The purely impulsive form of insanity may appear at this period of life; and homocodal, as well as suicidal, impulses may characterise the case, apart from any notable intellectual or enotional disturbance winterer. As we have before stated, the convulsive neuroses are prous to occur at all the cyclical species of life with special frequency.

If i aged bety two, a married women, in combettable commutators at time, was almitted suffering from severe mental depression. She was a strong, manular subject of medium height, but comewhat pale and anomal; had a family of three children living; and was last confined, some eighteen mental age, of a child-form child. Her habits of life were affected to have been commutest and temperate; and at the present time she was regarded as suffering from the functional allowable modest to the mentatural disma-torie; the menopause was not established but much prognistity existed. Paternal according of his wide's death. For three months she had been make balls, and had made repeated attempts to drown, cooks, and sufficient bernell, and also to cut for threat. Had expressed no delaware, and did not surface from hallomation.

No cardiac or unterial disease was apparent; the respiratory and alimentary systems were normal. The series was 1820 specific gravity, faintly acid, and devoid of alliamos or sugar. Catamonia were in arrest. A few days after advansion for morbid proposition declared themselves, and she attempted, by filling har morth with paper, leaves, or anything at hard, to shoke herself. Her restlemness at night, was relieved by chloral, and the solution effection of opins in 20 minim down was administrated two easily. Her aspect was expressive of a sour discussest, and from being reserved, reticent, and brooking, she developed hopechondrineal functors and queryloody and persistently drew attention to her magined almerts. A slight atrack of pleasing a formight after admission was followed by marked relief to her mental symptoms, and she left perfectly recovered two months later. She had not been at home over a formight ere her restless depression reserved, and further satisful tendescent led to her re-admission three months enhangemently. Her condition who as follows: ... "Free from stay aspect of depression; atterly indifferent and callous to less existing state; admits, with some flippotray of manner, being subject to sudden and momitrollable supulses to destroy breself; as delusion or hallocisation rise by traced in her account of barself c also is perfectly raise, surioual in all lies statements, and intelligent-Amountshots has existed for eight morths." Under windlar treatment she progreated during the first month so far as to be chouful, active, industrious, and, according to her own statement, had sufficed from no return of murbid impoles. She had, however, a somewhat careless, flaggard courser, which was groutisfactory as industing a reduction in the matal seem not natural to her. About this time she again become nonewhit quieralone, importantly about referring home, and there was slight hypothendrissis. This relatingted is her abstracting from a aughourd a spart beith of spirits, looking himself in the lathenous of an other's large, and deliberately swallowing the whole of the contents of the bottle. Abowas discovered in time to recent key, and to her recovery from her semi-complise.

[&]quot; See also Fleury, Journ. Menter Server, July, 1885, p. 551.

state the exceed that the had taken the spirits with spirital intert. Again she became more cheery, has hypothesidizated, active, and metal, and in its weeks time the was tried once more in an associated domattery, where she slept with fifty other parients. The protested for freedom from impulses ever time for last attack, and was loosed as time at the tried at loose over again. The night following this apparently genetic statement, she retired to had someof and was found in the early meeting strangled by a piece of traid which the had someof and concouled. The lighter was tightly secured, the best-dething perfectly undiscurbed, and the sheet shows over the face to score her from the observation of the peticula sleeping builds for reaffered without of the depends determination which had invaled the set.

Contrasted with the case of S. H. we may take that of A. A., in which maniacal perversions of a prominent nymphomaniacal anture prevail.

A. A. applifully waves, a survived scenar, of steady, temperate habits of Efe. without any assertainable nourotic history in her antecedents, came under treatwest after two weeks' excitement. She had only exemply been discharged from mother assists. She was in a state of subgrate excitement upon her administraand was dispersually appearing the expressed the delast in that the was Queen. that her knoband was king, and that she held the keys of heaven and hell; a waspictors tendency was also present which induced her to retain her food. She was pale and somewhat haggard; a famile bruit was hourd at the base; had a furtive suspicious expression, and an agitated eager manner; spoke of a contest about to done in the country which she might be able to arrest. She admitted being at the memputes. For some weeks after admission the expirement abated sufficiently to allow her to compy herself medally. Soon, however, marriagal symptoms again. experienced, and she has remained since this period subject to outbursts of exultement and intervals of calm. The petient entertained the most kinter feelings of arimosity against her husband whore the repeatedly account of being unione toher; she descented him at had and threatening language, become most furious and violent, and in her fremy destroyed all within her reach. Upon one occasion she tried to strongle herself by tying her halt round her neck. "Khe now betrays a strongly cretis condition evidenced by expression and gostare and harryions remarks; when less under self-centrel this tendency gives reed to expedite and obscene language. She has developed the delicans that one of the asylanofficials is married to her, and she republishes her throng knebank." It is now three years since the most of her demagement; she is inchestry in convention, betrays the same agitated manner, and is subject to periodic attacks of wild prosphonomical ecclionent to formerly.

Etiology.—In endeavouring to estimate statistically the influence of the climacteric involution upon the development of forms of mental alienation prevailing at this epoch, we naturally first question ourselves as to the relative frequency of insanity at this and other periods of life. Were we to take premisenously an aggregate of cases becoming insane at different ages over an extended series of years, we should become early convinced that the question, far from being a simple one, as it might at first be regarded, was really a very complicated problem to nurseed. In the first place, the population at different ages of life varies; so that admissions in quinquennial or decennial periods are derived from disproportionate acctions of the community. Hence we desire to learn not only the actual number of cases of inanity occurring at different ages, but also the ratio of such numbers to the population existing at similar periods of life. Thus a glance at Table on y. 429, showing the relative frequency of inanity at different ages for 1,808 female cases, admitted into West Riding Asylum, indicates the period from thirty to thirty-live as affording the highest number of admissions, and that each succeeding quinquennial affords a rapidly decreasing series of cases; yet, when we come to compare these numbers with the existing population at a corresponding age, we find, in lies of a rapid decrease of insanity at these years, that the ratio of occurring cases is maintained at an equable rate or, according to some authorities, is even increased.

In the next place, our statistics would embrace subjects from most varied conditions of life and occupation, each aphere of life bringing its own disturbing and exciting elements into the field; hence it is adviswile, in estimating the influence to be attached to the climacteric, to compare only that class of the community whose social status exposes them to more or less similar conditions of life. Unless this be done, we may drift into the error of attributing to a physiological cycle solely, what might more reasonably be expounded upon other grounds -the encroschment of environmental agencies. The wealthy and the pasper class (exposed as they are so each widely-different exciting agencies) must be judged agart upon the respective merits of their cases, for any such statistics embeacing all sections of the community, prespective of class distinctions, must be more or less vitiated thereby. In the next place, we must not forget that we are dealing with other important social factors—the single, the married, or the widowed state; and that our aggregate certainly includes a number of relapsed and recurrent cases, in which a well-marked predisposition to insurity expired, and in which, therefore, the climacteric epoch slouply usualles the disturbing forces.

In our attempts to classify such forms as appeared more especially dependent upon the climacteric change, we found it essential to eliminate a very large proportion of cases occurring at this period of life. Recurrent cases had obviously to be rejected, and so had all forms of insunity which had not originated at this epoch of life; and so also cases of epilepsy, imbrenity, and organic brain affections, where the climacteric was but the spark to the fulminate. This rigid exclusion of dubous cases left but a meagre residue of eighty out of 1.808 cases or a percentage of 4.4 upon the total minimisons. The

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actorishing disparity in estimates upon this point by different writers is seen in the following table:—

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Emis Herseli	Tho Milein	Mary Edin-	Interest of Belleville	Moreon y Work	World Kiding
Statistics of len-		iough B-rail	Arrivos,	Billing Agricus	Assistant,
States of Bosonity.		Applica.	Link Cases,	Little Chara	Local Court.
3476	3 to 4 1/	11.17	1247,	14 to 15 %	447

Obviously from the above the discrepancy must be involved in the personal equation. In fact, in the want of unanimity of opinion as to what really constitutes the criterion of a so-called case of climanterio instainty. It will be observed that one estimate (founded upon personal observation) closely agrees with that of Dr. Tilt, and we differ, therefore, in regarding his results as an under-estimate; * at the same time we glean from Dr. Merson's able paper † the real cause of such discrepancy. He there states in reference to his percentage of 15 that

"It by no means follows that in all these cases the classeteria condition was the only, or even the chief, element in the unsertion of the mental disorder, though a may be affered that in most cases it accurated a countries or modifying influence toward less marked. The factory of the cases investigated points in the conclusion that the charge of life is not often of modif the immediate mane of insurity."

The same writer then proceeds to particularies 76 ant of his 148 cases as industried by other exciting agencies, giving amongst such some 31 cases of organic brain disease, cases of alsoholic excess, &c. Clearly such cases would not comprise pure cases of anotheric dismeteric insanity as understood by Dr. Skac, and with this qualification we fully agree with Dr. Merson's remarks on cassation quoted above. Our own tables, which give but 14 per cent, include only such cases where the disturbances of the climateric change and menopasse were uncomplicated with other patent exciting agencies, and where we could justifiably presume that the insanity was the more immediate outcome of this revolutionary period.

In what way is this physical predisposition to insunity incurred! From the standpoint of the evolutionist, we are led to observe that the growth and development of the nervous-system in but a progressive expresentation and re-representation in ever-advancing and more complex terms of the whole organism; that the corelarum starlf is but a rast assemblings of each highly-complex representative realism; and that in the higher realism such nervous mechanisms as form the physical expression of such representation have linked to them the psychical correlatives of Seeing and of thought. The loss of any portion of the organism which has entered largely into our conscious life, or, in other words, has been frequently, or at all largely, especiented in

^{*} Psychological Medicine, Dec. Burkwill and Take, 3rd edit., p. 380.

^{1 &}quot;Climateria Tonod in Relation to Insurity," E. P.A. Rosein, vol. vs., 1874.

consciousness, will ascessarily disturb the mental balance. Nor could it be reasonably conceived that a portion of the body which had long subserved the wants of the organism, and whose physiological history was represented in certain organised tracts of the cerebram, could suffer ablation without some attendant commercion in the brain. In fact, the systemic and least relational structures are in their generic so closely interwoven with the physical substrata of feeling and emotion that wide apread disturbance results from their derangements, functional and seganic. The encemous share taken by the generative system in the physiological and psychological hife of the female is a subject of paramount importance in our studies of the varieties of insanity. The organs subscribest for some five-and thirty years to longer to the important functions of meastruction, ovulation, gestation, lectation, find their nervous representatives in the fundamental tracts of the percous system, and draw largely upon that system during their life of functional activity. Periodic relays of serve-force demanded for the regulation of their blood-supply and of their muscular apparatus, and the ingoing currents crowding upwards from so extensive a system, enter intimately into the very web which forms the physical correlatives of emotions and moral instincts. The vast accession of new imprescions registered by the sensorium when these organs awake to functional activity during puberty has a most profound effect on the mental constitution an effect whose significance cannot be mininterpreted; for the result is a real transformation, more or less, of the ego, with all its feelings, emotions, sentiments, and desires. At each subsequent periodic crisis incident to menstrustion, gestation, incration, sterine involution, the peryous-centres are profoundly affected by the resultant transformations undergone, such periods being eminently periods of nerve instability.

Pre-eminently is this the case at the menopurse and grand climacteric, when the whole of this system loses its functional activity,
degenerates, and, in fact, passes almost completely out of the life of
the individual. Both subjective and objective accompanizements of the
menstrual melimen in a greatly-exaggerated degree complission and
usberin this serious disturbance of the nerrous-centres—beadscise,
sertige, fatniness, "heat-disthes," emotional waves, phases of moral
prevently, irritability, querulous impatience, even intellectual disturbance (especially of memory and of attention) prevail; and, wanting the
relief affected by the depurative process of menstrustion, the sintreus
is often a long-continued and urgent one. This, however, is the earlier
stage of functional decreptitude, the carry phase of which is characterized
by want of decision, lamitude, and believiele. It is essentially a period
of voluminous exections, purposeless waves of feeling, abortive years
ings, redundant, vague, uncontrolled desires, and misdirected energy.

That great reservoir of nerve-force, which had for its object the procreative functions of the organism, is now objection, and its expensiture must now be directed into other channels; a period of constional instability unders in a period of seconstructions.

J. F., agod berty-see, single; admitted January, 1990. Patient a latine was very intemperate; her mother and brother had been fermion of this anytom. J. F. 's life had been a very indeppy one. For many yours she had been compelled to dwell with last brother, a brutal, drawlers seemabled. Buring the two months below being taken to the asylom, she had developed dangerous, impulsive temberation, sublemly striking. Isting at, and kicking those largeoning in be accord for When admitted, a condition of fairly calm attention and apprehensioness was constantly interrupted by outbornts of ferrous excitoment and visions. As immass self-congratulation in her power of constinuing terms by lay actions, seemed possibly of influence in the production of law paranyons of passion.

For three results the was liable to those dangerous impulses, of which the was aware, and expound for grief at being unable to restrain them. Subsequently she passed through phases of subtractes, depression, and agitation, to quietade and industry. The extracteria, absent on her admission, returned during her latter

period of correlations.

This speck of reconstructions is one of peril to the mind, especially to these ill-trained mental constitutions in which the passions have been allowed an uncentrelled expression; and where intelligent guidance has been denied to the instinctive desires. In fresh objects of affection, in new pursuits, sinus, and studies in other forms of moutal culture many minds will seek and obtain relief for these perturbed feelings and pent-up emotions. The anxious and intelligent mother will find a sufficient object in the prospective life and well being of the offspring; many cultured minds will find in the fields of literature a sufficient relief to their pent-up energies; whilst those who lack in such facilities will perhaps bead their attention towards schemes of education or charatable movements; and the instances are not few where the political spirit of the times affords, in our day, missions for the same subjects. The peril of this period is one incident to all periods of reconstruction arising during emotional turnoil and perturbution. Reflection wants the calm essential to its orderly operation, and judgment is liable to be warped and one-sided; hence, also, it is that thus ago of life is one prone to bigotry, to religious fanaticism, or to conduct based upon dogmatic and immature beliefs. An unusual and inordinate religious real is, indeed, a most frequent expression of this transition-period in mental life; and this is of interest viewed in connection with the characteristic delusions of the insanity of this age

We hear of a similar dismeteric in man; but the parallel is more funciful than strictly correct. Even its advocates who speak of climatteric insanity in man, alliede to it as occurring "at a later time of life than in the female; . . . much more irregular and indefinite. There is nothing to mark it off so clearly as the menopause" (Clouston).*

The period assigned for the decline of the procreative power in man
is 55 to 65; in fact, the borderland of assolity and not a genuine
epochal transformation. As Barnes states:—"there is nothing to
compare with the almost sudden decay of the organs of reproduction
which marks the middle age of women." + With a certain proportion
of cases the menopame in women may, in like manner, under in premature sensitity; but, in all, its more or less sudden onest and the great
constitutional changes and local transformations wrought, frequently
followed by the subject taking up an entirely new lesse of life, give to
this period a critical character wholly distinct from what we see in man.

Prognosis.—The sitimate issue of an ordinary uncomplicated case of imanity at the climacteric may certainly be considered a favourable one; favourable, that is, as regards the duration of the maindy, favourable as regards the stability of the reinstatement, and favourable as contrasted with the recoverability of all cases of imanity in the female when taken collectively. Even when all cases of imanity at this period of life are considered, whether of recent or of remote origin, complicated or otherwise, still one half of such cases constitute absolute recoveries; and the favourable progress of the affection is indicated by the fact that three-fourths of the recoveries take place within nine months of the onset of the attack.

What, then, are the special features which serve to demarcate the favourable from the unfavourable class! what are the elements which enter into a favourable prognosis and the reverse! The hopes we can give to our patient's friends of a perfect recovery will largely depend upon the "time stement," which plays so important a role in determining the prognosis in most forms of insanity. An early and suppl core is, as in other oases, favoured by early treatment; and the chances of a complete and spendy recovery are much atrengthened if the subject come under appropriate treatment within two means of the onset of her aymptoms. We would emphasise here the speedy return to a normal mental vigour, for it is in this particular that early treatment is so desirable. The actual numerical result of recoveries coming under treatment, from a week up to three months after the onset of their symptoms, is about the same for all (50 to 60 per cent. being recoveries); but, beyond three mouths, fewer actual recoveries occur, and a large aggregate will be relegated to the class of the chronic insane.

Will the recovery be a stable one, or will the attack subject the patient to further liability! As a general rule, it may be affirmed that the more fully the affection realizes the churacter which is regarded as typical of a truly epochal form of inamity—i.e., the more fully it

^{*} Op. ck., p. 560.

⁺ Chairel History of the Diseases of Houses, Earnes, p. 963.

appears to be the issue of disturbances sacident to this period of life—
the more likely is the return to normal health to prove a secure and
permissent state. Hereditary prelimposition will, of course, in such
cases produce its usual results, subjecting the virtim at any period to
a relapse on the insidence of exciting agencies; and the predisposing
influence of former seisures will also have to be considered and allowed
for in fracting our reply to this query. An actual study of our cases of
insanity at the elimenteric shows that some 27.7 per cent, had a family
predisposition to insanity; and that 35 per cent, of the total cases had
suffered from a previous attack of mental decangement. Yet the
actual relapse after confirmed recovery from this form of insanity
occurred but in four instances out of the whole series of eighty-three,
and in three of these a predisposition to insanity was indicated by a
former attack in earlier life with strong hereditary boint.

Another point of importance in prognosis to recall is the mortality institent to this affection. The deaths, which amount to 14-4 per cent. at the West Riding Asylum, are due to intercurrent affections, in which phthosis or pneumonia play the chief part; in fact, one-half the deaths occurred amongst the chronic class who had resided at the asylum for a period of from two-to-six years. It may be stated, indeed, that the insunity incident to this period is rarely, if ever, fatal in itself; and the chronic remnant of this class one their unfavourable character chiefly to the exhausting influence of chronic pulmonary disease, alcerative affections of the bowels, or the malnetrition and defective blood-supply of the brain, due to an enfeebled and fatty heart. Another factor in the prognosis is the age of the patient. It has been observed by Dr. Clouston that fewer recoveries occur after fifty years of age—an opinion with which we concur.*

The previous liabits of the patient most likewise be taken into account, and especially does this apply to the use of alcoholic stimulants, so frequently indulged in at this period of the woman's life. It is a well-known fact that secret drinking habits become pecalizely frequent at this era, a meriod staving for attendation being engendered by the depression entailed at this period of reconstruction. If this vice has been contracted the malady always appears in an aggravated form. The very nature of the mental disturbance, the debutional molansholia often hardering upon a hypochemicianis, and always of a self-accusatory character, finds in this grievance a sure foundation for its glossy fears and geneine despair; these cases, as already indicated, are peculiarly prove to suicidal impulse. Such subjects may exhibit much outward calls, have an absent manner, a self-engressed sepect, or a suspicious factive reticence, or tetray on those features the set aspect of despair—indications which about place us an our guard.

The question of time during which the alicentics has existed, the age of the patient, her hereditary predisposition to immity, and the acquired predisposition through alceholic indulgence are some of the chief factors which enable us to arrive at our prognosis in the case.

Very divergent views have been expressed with respect to the prognosis in climarteric insanity. Thus one authority says :--

"Climaterii intensity is furthern being a hopeful form of mental derangement,"

Van der Kolk steies—" If coligans melanchely begins in the climateric years, then the prognosis is inforcemable; "wintst Dr. Moreon says—"The history of the cases I have investigated, however, shows that as regards altimate recovery the prognosis is by no means unforcemable, though an early recovery is not generally to be expected." *

Dn Clouston gives a percentage of 57 for recoveries in the fenale sex; ‡ Dr. Merson's table realising 59.5 per cent, or 47 per cent, when cases uncomplicated with epilepsy, general paralysis, and other brain diseases were excluded. Our later statistics it will be seen, afford in a recovery-rate of 48 per cent, and, therefore, justify the views expressed by Dr. Merson.

What is the issue of the attack in the more enforourable cases? It appears that about 28 per cent, form an incomable chronic residue, and about 14 per cent, meet with a firtal termination, half of which fatal cases also are derived from the chronic than. Yet these unfavourable cases do not necessarily demand asylum-supervision; in fact, one-half at least become relegated to the home-rircle again, and are able to discharge in a fairly-satisfactory manner the duties of the wife or mother, or compete for livelihood in their various spheres, Such incomplete recoveries are instances of a permanent mental enfeeblumens, but are by no areas subject to the recurrence of scate symptoms. They remain mental wrecks after the storm, the depth of reduction varying much for each individual case. Quiet, onlyely, inoffensive, they need only the kindly guidance of the home sirele to keep them right; yet, they exhibit an unwinted spathy, an indifference to farmer pursuits and pleasures, a lack of energy-mental and physical -which was present in their old solves. At times depressed, they never show active saleidal symptoms; but exhibit a flatbinous of purpose and will, which render them for lifetime the dependents upon a stronger mind.

There is a remnant left, however, of these climacteric cases where the issue is far different, and where some of the worst forms of incurable delusional munity become established. Here await halfocinations

^{*} Psychological Medicine (Fen. StrakedBard Take), p. 14%.

⁺West Maling Asplant Reports, vol. 11 . p. 10%

Thomas proper

largely prevail, and a sexual element often appears to enter into the material of their delenions. However agent at the windows listering to the communications of these unseen agentses; to which passionate, wild outbursts of obscenity and abuse often ancessed from the infursated victim. Such attacks of excitement largely prevail at night; and the delesions based upon such sensivial anomalies lead to aggressive and destructive conduct. For many years these subjects remain a prey to these deladed fancies; are smally self-opinionated, or arrogant, even bearing, default in demeasour, and torse a section of the more today and dangerous class in our asylane wards. In such cases we can only hope for the spendy neighbor of a demential before which the painful sensorial states and delusional preversions tade, while a settled calm and negative state of mind take the place of former turnous.

Treatment.—A tonic regimen is desirable in most cases of insanity at this epoch of life. Open-air exercise should be enjoined; a free natritious dist devoid of stimulants; and careful attention to the prime vie. An aboute purgative is often desirable at the cases, followed by mild laxatives, of which the mineral waters are a convenient form of administration. Our experience teaches at that a large proportion of cases recover without any form of medicinal treatment; the removal from their homes, the influence of new associations, and, above all, the strict attention to directic treatment sufficing to ensure a case.

These are certain cases, however, where medicinal interference is impossitively domanded. America must be not by the administration of iron, perferably in the form of the ammonio-circute, and in combination with small dome of the figure dramaicalis. Iron should not be given if soute symptoms prevail either of the menincal or melancholic stamp. We should await the subsidence of these symptoms, meanwhile trusting to agencies for ensuring sleep and to a liberal diet.

If there be a tendency to refuse food, we must not permit our patient to except on the excuse of having partially taken her used; a due amount of milk and eggs with beef-ten, nourishing soups, and farinaceous food should be rigidly insisted upon; and, if necessary to resort to force, compalsory feeding must be adopted.

Sleep must be secured by the administration of chloral, brounde of potassium or paraldehyd; of which we certainly give preference to the first. It is rarely necessary to give larger doses than 25 or 30 grains; and where from cardiac enfectionsent its use is insimisable, paraldehyd may be substituted with good results.

The indiscriminate use of solutives in these cases is, we think, to be deprecated; and, only in the more acutely stamped types would we feel justified in the more continued use of solutives. For this purpose chlocal in combination with brounds of potassium is the safer treatment to adopt; opium or morphia, henhans and conium have proved unsatisfactory in our hands. The brounds given separately from the chloral we have less confidence in, and the combination found most desirable is 15 grains of chloral with 30 grains of brounds twice daily. We by no means share in the unfavourable view expressed by some as to the general inutility, or even burifulness, of sedative treatment in the scute forms of mental aliment at this epoch; given the means of securing efficient alimentation, such treatment is often followed by the best results.

SENILE INSANITY.

Contents — Mental Decongements Incident to Scotlidy — Sende Mania — Sende Melanchelia — Chronic Cerebral Atrophy — Sende Convalence — Sende Egdepay — Sende
Demontes — Inhoritance and Factor in Sende Insumines — Enhanting Sende — Alcohol and Sendity—Chass of T. G. — Coset and Fredromata — Chassotse of
the Sende Sedentions—Sende Hypochanditanis (J. A.) — Sende Atrophy and
Thrombonis (L. S.) — Acrite Sende Melancholm and Synocyal Attacks (H. D.) —
Partial Emitation in Sende Insunity—Delasional Perventions of the Mesomarins and Sende Subject Contrasted — Sende Americ — Come of Sende Insunity
(M. M.) — Elimination of Uron in Chronic Corebral Alrophy and Fremature
Sendity—A Local Manifestation of Chronic Bright's Disease.

The student is apt to mis-apply the term smalls (assuity, that foem of scalle decrepitude which is but a morbid exaggeration of selemiological senility , that gradual obsubilation of mind known as reside descentia in aps to be taken as a type of what is implied by senile inssnity; and, so far is he right, that it is doubtless true a far larger proportion of cases of meanal inquirment in sensitivy belong to this than to any other category of mental nilmont. He is, however, too apt to amome that all varieties of mental ailments in the aged issue in smile dementia; and that the maniscal excitement which is so frequently observed at this time of life is necessarily the accompanituent or the precursor of senile decay. It is therefore, necessary to indicate that this term counctes a very large class of symptoms, embracing between them all the varied forms of invanity usually differentiated. The pathology of old age is as unique and interesting as that of infancy and adult life | and, light as we are aware, that certain periods of life bestow a special minumity from certain morbid affections, so do we find old age by no means an exception to this rule. That it has its own special affections of the central nervous system, as of the body at large, is also a wellestablished fact; and that such morbia changes are characterised by a special tendency towards atrophy has long been recognised.

Apart, however, from such special immunities and proclivinies as this period of life is apt to entail, there are other forms of mental alienation common to it and to solult life which must be taken account of ere a faithful picture of scalle leasnity can be framed. Simple mejancholic states, maniacal perventions, in themselves recoverable forms; or more obstinate delucional perventions with or without, personnent dementia, paralytic dementia, the dementia of absention cerebral atrophy, epilepsy, and even general paralysis, may severally be encountered during advanced smallity in the prelimposel. Yet, it is note the less true that such affections, more common at other epicha of life, are considerably modified by the physiological studium, and are stamped with a special impress which more or less distinguishes each form of scalle alienation from the psychosis of earlier periods of life.

A careful study of insanity amongst the senilo admissions into overasylutor, and an attempt at a satisfical classification into groups according to their most obvious pathological indications, will cause the student much perplexity at first, owing to the extreme multiplicity of symptoms which he encounters amongst such cases. He will early learn, through the painful experience of a facility diagnosis, that it is easy to conformé functional decaugements with the earlier indications of organic brain-disease; and he must be fully prepared to find his prognosis stultified, unless due attention he paid to the modifying influences of the social epoch over the nature and operate of the disease.

Senile Manin, - He will meet with forms of simple maniard excitement without any very obvious enfechiement of the intellectual faculties, in which emotional instability, incessant gorrulity, and restlearness are the only obvious disturbances recognised. Such excitoment may vary from one of alight degree to very scate forms; and, in the latter case, may prove most persistent and most obstinate to all remedial agencies. The rambling disconnected speech may pass into utter incoherence, the motor restleaness become extreme, and insomnia dely all our means of relief. Such cases of senile mania may require long-continued and forcible feeding, and cause us much anxiety lest a fidal degree of exhiustion ensue. And yet, such cases, although often the precursors of permanent il-mentia, may completely recover and leave our patients with sourcely a vestige of mental enterblement apparent, beyond what is natural to their time of life. It is to the distinction between such recoverable forms, and those intercurrent. attacks of maria which are frequent suring progressive senile atrophy of the brain, that the student will have his attention chiefly directed. Recurrent maniscal ettacks are of special frequency amongst the aged iname, who are prone to explosive discharges from their ill-mariabed and highly-unstable corebrum; and such recurrent scipares are notably present in those senile cases who have acquired a predisp softion through alcoholic indulgence.

Senile Melancholia. — A second group of cases is presented in these focus of simple melancicitic depression to which certain predisposed

subjects are liable staring the physiological involution of the nervecentres on the advent of senility. Depression at this epoch is always of most ominous import; it may be the precursor of senile mania, it may usher in hopeless forms of senile dementia, or it may be the warningnote of those serious forms of dementia which are connected with an interstitial or gross cerebral change, such as occur in chronic cerebral strophy with its sciences, or homorrhapes, or softening from thrombi-Here, again, the steelent will find his nitention profitably directed towards the diagnostic distinctions betweet simple senile melancholia as a purely functional ailment (which is a fairly recoverable form of alienation), and the depression which angure a serious structural change in the nervo-centres. As we shall see later on, such forms of simple melascholis, unaccompanied by any definitional state, are notably characterised by their strongly-marked suicidal tendency, which appears in 79 per cent, of such cases.

Chronic Cerebral Atrophy,-Passing by these simple forms of affective insanity, we arrive at a third, and a very interesting, group of cases, which, whether the symptoms be considered from the mental or physical side, present evidence of a very definite pathological pracesswe allude to chronic cerebral acrophy. This is an affection no more limited to senility than the foregoing, set it is of special securrence at advanced age. The affective sphere of mind is also here involved, and painful mental states predominate. Despondence and gloom inves at times in acute melanchelic or maniscal outbursts, yet morbid descession is here usually associated with enfected will and a special tendency toinstinctive, impulsive states. Chronic nolancholis, with impulsive peoponsities, is the preminent mental symptom. The disease appears to project itself mainly upon the austorial subere of mind; and the diseased vascular teacts in the cerebral benispheres are peculiarly peans to appear in the frontal and motor realms, cortical and ganglionic. A group of symptoms constituted by despondency, self-absorption, general intellectual torpor, failure of memory, enfeebled velition. impulsive conduct, often desponsely-solcidal attempts; and, with this, highly-characteristic physiognomical signs, such as a paintel, recent. mostly a dailed, butterless ove, a jaunificed earthy tings of integrment. torticous radiale, temporale, or brackings, a slow and laboured atterance. and an offer want of initiative-are in themselves a very suggestive category. When, with such a case, we find general nuncular entechie. ment progressively advancing, a history of slight, transient strokes, a very temporary loss of speech, a slight glossoplegia, facial or brackiel monoplegia, or slight synespal or vertiginous attacks repeating themselves frequently, we may be gretty confident that we have to deal with a cuse of chronic cerebral strophy as the result of vascular disease, and probably associated with considerable renal and cardiac degeneration.

Senile Convulsions.—A fourth group presents itself under the form of convulsive affections. After a more or less prolonged period of mania or melancholis, the persistence of which may be unexplained; there will suddenly seem a partial or general convulsive senure, with, or without, less of consciousness. The patient henceforth becomes subject to more or less periodic attacks of genuine epilepsy or epileptiform convulsions. Such cases, lowever, are not so numerous. Out of 260 cases of senile female admissions but 20 cases, or 7% per cent. of the whole, were subject to convulsive attacks, and in not more than one-half this proportion did the convulsive neutrons assume such a grave aspect as to be regarded as the most prominent morbid feature.

Semile Epilepsy occurring during the course of any form of mental alienation is, of course, of very evil augury. It betckens, natually, a localised nutritive decangement of a grave character, due to discussed vascular tracts of the cortex or ganglis at the base.

Senile Dementia.—Lastly, there is the well-known insane dotage of the smile dement, in which all the mental faculties are progressively affected, and in which maniscal excitement, or, less frequently, melancholic gloom or agitation, may recur over and over again, and very vivid ballucinatory and delimioual conditions may prevail; yet a steady docadence of mind proceeds and utter fatuity results.

With respect to the question of inheritance in scalle subjects, let us remember that although much depends on the organised stability of the nerrope-centres, we must not omit to lay due atress upon exceptional environmental conditions of life, and especially upon conditions self-induced, or to which the organism wilfully exposes itself in detante of all physiological dictates. Whatever he the resistance of the organism to morbid excitants, we can safely assume that the latter easy reach such an intensity as to break through all opposition, and that inherited instability need by no means be predicted in such cases; in other words, insunity may be acquired purely ab earen. We have too many instances afforded us of the break-down of good, stable minds through the stress and tension induced by surrounding conditions of life, to permit us for one moment to heritate in our acceptance of, or to allow us to qualify, this statement. Sustained mental exertion may be carried on under unfavourable circumstances to such a pitch sa to ione in complete demoralisation; undue stimulation of nervous centres already fagged by overwork, will as certainly, if persisted in, entail in the issue complete disorganisation, or deterioration of the output; it is, therefore, highly necessary that we should lay full emphasis upon the environmental conditions. Given a case of strong hereditary predisposition, and we infer that slight exciting agencies will suffice for a culmination in some morbid development. Given but a feeble predisposition, and the resistance to murbid excitation rises; so that a

petral rature only objectes will induce the victors evolution. Yet it is equally true that, spire from any rescendie ancestral frailty, certain victors conditions of life will of themselves induce such cerebral disorder as to colorinate in an attack of instality. What do we know respecting ancestral history and the interaction of the environment in cases of senile invanity!

A predisposition was clearly ascertained in some 58 cases of serile insanity out of 261 male patients, or a percentage of 22. This estimate includes colleteral and direct transmissions, and was limited almost exclusively to the parentage and to the collaboral line of brothers and eisters. If direct inheritance only be taken into account, the percentage would still remain as high as 15. Now this is considerably above Dr. Chouston's figure (13 per cent.), and, in fact, lies midway betwint the percentage given by him? and the average heredity ascertained for 1810 cases of all forms of insanity alike (\$1-5 per cent.). Dr. Clonston. speaks of ancestral inheritance as "rovy necosascos," but admits that such estimate includes a fallery "that the facts about heredity were further back and more forgetten in this than in any other form."+ Such a qualification, undoubtedly well-based, arolles equally to our own statistics; and we may with justice assume that an insane inheritunce would, if all the facts were forthcoming, be found to be pretty much what is the average for all forms of insanity taken together.

But apart from the frequency of its necurrones as a factor is the agastion of the nature of such inheritance and its intensity; unfortunabily our data for a reliable conclusion upon these points are too scanty. Dr. Clouston's assumption is that ... To have survived, therefore, the changes and chances, the crises and perils of life with intact mental function tall after sixty, means slight nonrotic herodity, or great absence of exciting causes of disease."! Were we to regard the dictum that the strenger predisposition is manifested earlier in life (open as it is to such activement exceptions) we would still take exception to applying such a law to the cases of insunity under consideration. What are the positive facts before us? If we take into consideration all forms of neurotic inheritance slike, we find a percentage of 264 give such histories; that in several cases both father and mother were insane; that in some, several members of the family were epileptic; that in others, sirect hereditary immarity was traceable (associated with epilepsy and paralysis), and that suicide was not infrequent in the family. We should, therefore, incline to the view that the senile issue exhibit a fairly average prodisposition to ineanity; and that, possibly, its late development in such sellieris may depend upon the server of the pearotic inheritance and the developmental period during which it was originally acquired by the ancestor; for the law that a morbid condition tends to reappear at

an surfier age in the progens is not final upon this point. For as, however, the more important point for recognition is that whatever proclivity towards insunity there he in such subjects, due to inheritance, there is a most powerful agency in operation in a large number of such cases in the surrounding conditions of life. Undue cerebral excitation, whether in the form of excessive mental work, and especially when prolonged intellectual operations are associated with auxiety and worry, or exhaustive emotional states, frequent exhaustive demonds upon the intellectual operations, austained mental tersion in the struggle and competition for existence, will, as we well know, result in utter mental and physical prostration, even in those who possess the elasticity and resistance of manhood; much more should we expect such agencies to be operative for ill, at an age when the brain-cells have reached their limit of normal functional artivity, when function devlines, and physiological dissolution commences, in the series of downward retrogressive changes of senility.

Such unwise demands made on the nerrom-centres during adult life are prote to induce premature sensity, and the various mental derangements to which the aged are subject; but a still more perent factor is comprised in the association with these conditions of alcoholic stimulation. Excessive alcoholic indulgence lends a frightful suspense to the repregnale changes of this speck, tending to over-excitation and exhaustion of the nerve-cells; to retention of hydro-cerion in the system; to vascular parests and disease of the arterial tunies; to universal degradation in type of those, notably of the nerve-centres we may, indeed, readily appreciate the evil effects of universal exertion harbed up by alcoholic stimulation.

T. G., aged fifty two, married, with a family of two children, a miner by occupation. Partient was infloring from his first attack of insacity, which began a mouth age. He was a short, well-commised subject, of family complexion, our inserties tinged; accurated well marked; pupils equal and active; slight flattering of right side of face; tenges protraded straight, slightly troubless. These was accessive searchility of the sides of the feet; when these were tickled, the whole body was those a interactive state. He had formerly been addition to very heavy drieding, although more abstances theing the past feet years. His father death to stores, and was a "bad character." His father's sides out her threat at the adjust. Patient's two moors (twent) are at present tanales here. Mother was at this time seventy five years of age, strong and hale. No history of created injury.

About eleven months ago, patient had antient convolute movements of both sychalls (upstances), and, selectively, jurking movements of the food and note. He sought treatment for his eyes at the Looks Enfirming plant, while there, his limbs enddenly the might were thoses and convolute movements like the head Such movements occur frequently, but have also discussed him completely for a week together; they are always increased throng constinual states. He had grainally less proves in his right new and log; and special also had become running

required. (thirdish second were then noticed) he would collect worthless rubbish, seek, if deprived of it, become most planforate and visitest. Moreovy determinated, seek in began to minimize his acquaintances and relatives. Great invisibility was apparent later on; he would violently mount little children without obvious realism.

A fortuight before admission he had, he the first time, a moression of fits, in which "his eyes were drawn up—be fruthed much at the mouth, his mouth being drawn to use sale (which sale unknown); his limbs were much jetted about, and he remained for some time unconsetum." Had suffered lately from strail and visual influeinations; normal his wife of being untartiful to him, and said, "people make a fool of no." He had threatment his well with richmon, and had said he would not he first.

He was emotional space his achainster, singing, suspense, and rambling alternately. He was then obviously suffering from stants aphasia, with a certain degree of amount. "Asked to pronounce a certain word, he impountly repeats the first exhibit before proceeding, and when the word is completed accommodity, he is again to resternic the whole ward over and over again, or interpolate it subsequently into a sentence wholly involves and inverge to it is content."

"He understands all that is said, but his regime are largeredly quite incomprehensible; memory is notably impaired, and consciousness so far affected that he falls to recognise where he is, when he mane, or the nature of his surroundings. He shows the incompanions obtained by memory for any given raises or date as characteristic of contain alsoholics." He still evinces character of his selfe, and is an local to impate to her all his treather and present physical albertos. Attention is commanded with this case. He becomes resultly continued and agented, when his breathing it necelerated, and chorse movements of head and limbs experiency; becomes consecuted impaired by the judy movements of his larger.

Such being the history prior to and upon admission, the patient, a fertingly later, had several resources of the observe movements, became develodly soleral, dashing bitself bend forement as the flow. Three mouths later, he had a paralytic source ending in most. He fell on his bares, was unconscious for a short time; the right side of flow and right aims showed unsenfar twitchings—the eyes turned to the right side, and the sychole were convulsively affected. The twitching of the right side, and the sychole were convulsively affected. The twitching of the right erm continued long after extern of convincement; slight right beautyleges was present the following day.

For several weeks he continued very restline, is a heavy, stepal state, and evidently much democrack; both pugils minutely contracted. The limbs become more enfection, and he had to be kept in bod.

A resurrance of the convulsive attacks supervised some months later, and after fying for a few days in a new-conscious state with toustant twitchings of the limbs, and a high temperature, he should

Some enter. Shall cop symmetrical, of average thickness and density; are able now of their mater. Structure contained fixed black. Arachitekt spaper over frontal and parietal regime, with considerable think in the mester of pia unite, which was third and tough, but stripped fronty. These trees one or two doubtful patients of alliesions along the marginal or their frontal gyrus. Vessels at how more very acknowators. There was great wanting of gyrt in the frontal and parietal regions, specially on the left sels. The beam throughout was roller than normal, and of a duty, many line. The gray matter was shallow; the white matter studied with vary remerces comes remain, showing also know settless small patches.

of a peaking ties. No special focus of softening was ented. Corebellum and basel gargin presented no change.

Whole brain weighed 1220 grass.	Left fruital lobe weighed 198 green
Flight hemisphere \$55	Corebellam 167
Left 11 _ 416 11	Poen 11 20 11
Right frontal bile 327	Medalla #

The lames weighted \$55 green i usuade pale, ill-received a hirge paretter of athresma at base of north a valves benithy.

Right long, \$65 green; intensity engaged throughout, but will floated, and on pressure ampitated; no tubercle or inflamentary industries.

Left long, 816 grean; adherent by aid throug bander like the right long, it was engaged throughout.

Liver, Srealy Iouand to displaying a salutance from and file-us.

Spires; 163 grunt, 1 rougested and fruitle.

Right kidney, 140 press; left kidney, 180 press. Capsules were adherent in both organs; the surface granular; the substance greatly wanted in sortical and pyramidal portions; the private of the right kidney was diluted.

Of the S61 male senile cases, as many as 75 (i.e., 28-7 per cent.) were conclinerally proved to have been of intemperate habits for some years prior to their attack of instally; and there is reason for regarding this percentage as far below the actual truth. Later on, we shall find that alcohol gives a special direction to the morbid tendency, having a preporderating influence in the production of special forms of senile psychoses. Thus senile mania, melancholis, and the dementia of chronic cerebral strophy each affired an alcoholic history in 40 per cent.; whilst amongst the senile dements proper, this factor appears only in 16 per cent.

Onset and Prodromata.—Were we to stimpt to define the boundary betwint the physiological and pathological form of sensitivy, between the ordinary second childrahuses of old age, and the dementia resulting from the senile already of disease, we should find the task a difficult of not an impossible one. No such limit exists; the one form passes by such gradations into the other, that it is, at times, impossible to say that the physiological retrogression has been respected, and that the symptoms imply no generic pathological change. Cases there are where the onset of untile dementin is so marked, or se sudden, or so presenture, that no doubt whatever can be entertained that the physiological barrier has been overstopped; yet, in most instances, the atrophy of presenture sensitity, at its enset, herable itself by very uncertain symptoms, which pass by insensible gradations into the less equivocal character of the fully-developed disease.

Amongst the prodromal signs of this affection are an uncertainty and fickleness of disposition, and rapid changes of mood. Moody tocitornity alternates with fits of almost children hilarity. The patient exhibits unreasonable irritability, spannodic passion upon trivial occurrences, intolerance of contradiction or centriction, and impatience of former pursuits. Dr. Austie has drawn attention to the irritable pervenity of early stages.* Hebetude and lassitude are frequent precuraces of incipient cenebral strophy; but, the more striking feature is the alternation of needs, emotional variability and explosiveness. Headache is often a prominent symptom, and vascular targenomes a notable feature; elight exertion, such as ascending a hill or a flight of stairs, or violent laughter, coulting in swellen contected veins and florid face. Then arise naticeable defects in the intellectual operations due to occasional lapse of memory, very occasional and very transient, yet anxiously noted by watchful friends. Insonnis at night may alternate with diarnal hebetude, lessened activity and languor.

Symptoms.—Such signs are of oninous portent in those advanced in years, or whose former mode of life is known to have been favourable to premature sensitity. An attack of maniscal excitement may now unber-in unequivocal signs of the nutritional impartment of the brain; and upon its subsidence, well-marked indications of enfeebled mind appear.

Similarly, much mental depression may ensue, and metancholic agitation precede the more profound reductions of a later date. In the greater number of cases, however, the transition is a gradual one, from the predromal signs indicative of failing nutrition, to those of functional decangement of greater gravity, or of its complete arrest.

The failing mental powers illustrate the law of dissolution, whereby the highest and last-evolved members of a series fail earliest. The power of abitract Mounts suffers early; complex reasoning becomes a painful effort | mental processes generally became simple and more automatic. Representative states are less riporous, and association of ideas enfeebled; hence, the contrasting faculties of the mind loss their former energy. The creative operations of the imaginative sphere decline, and reverie starps their place in the mental life. The higher emotional states and moral sentiments fall to affect the mental life and the conduct of the individual with the vigour of former days; and, in fact, the possible adaptations of the organism. are far less complicated and its environmental bericon is correspond. ingly limited. This may all be true, and yet memory may not be greatly affected; sooner or later, however, this faculty declines, and, as has been frequently observed, the failure is chiefly as respects recent erents, the more remote events of the history being recalled rividly and accurately. We do not here recognize the instantaneous loss of impressions referred to in alcoholic cases; it is not a feature in

^{*} See Psychological Medicine, Backwill and Take, p. 342.

senile invanity apart from alcoholism; yet, that there is greatly diminished impressibility in senile dementia is novertheless true. The characteristic senile memory, the diminished sevicability of recent impressions as compared with more organised once, betrays itself in the whole tenor of the national's life homosforth; he lives his childhood's days over again; recent impressions have but a transient and faint influence upon his ideation-or they fase with the more vivid. series of older and more remate states of feeling; a dreamy reverie takes the place of vigorous perceptive processes; bycyons ovents appear transformed into existent realities, and are blended and confosed with the passing events of the moment. Localisation in time and space will eventually be impossible, and complete incoherence of thought will enone. Although this law of dissolution is invariably exemplified in sacile dementio, it is remarkable that at times we are surprised to find, even in cases of profound enfooldement of memory, a transicut gleam of intelligence—the recognition of a series of perfectly recent impressions in their natural connection—when we had supposed the subject was completely oblivious to such circumstances. This seems only explicable on the assumption that the law of trivial association will bring together the recent improvetons of the moment in relation to the more deeply-organised states of the past; and that the more deeply-organised are the states with which such recent increasions are associated, the more recoverable such states of consciousness are and the more resistant to morbid influences.

Now follows a greater or less blunting of the special seases; deafnote is a common symptom; there is also slowed pervous conduction and a sluggish reaction. The expressive faculties suffer likewise with the impressive sphere; not only in the subject less recipient and impressionable, but he is also less reactive. The intelligent initiative is rarely assumed; all actions are more instinctive, automatic, and impulsive: speech is hesitating, slowed, and highly characteristic-not only as the result of dementin; but also become the tongue has lost its examing and is less glib; there is a distinc for any mental effort from the outset, and eventually an ulter inshirty for contained concentration of the mind on any one subject; there is an equal distants for physical exertion. Reduced to an automaton, in stery sense of the word, his habits of life are simple in the extreme; and all his feelings, thoughts and utterances surour of succeess and repetition. Of all the imane, the semile demont is the one whose habits of life are most stereotyped, and whose actions generally and speech are least variable and, therefore, most predicable,

In the dissolution of his nervous organization the doubly-compounded obythmic actions of an elaborate nervous receivanism appear to have given place to the simpler rhythms regulating the activation of simpler forms of life. The physical signs of smalle decrepitude are notably marked; they are those of almost universal strephy. Exceptional cases occur where obesity prevails; but the rule is that all the timese, sincess (except least and kidney), and glands undergo excessive strophy, often preceded by fitty degenerative change. It is scarcely necessary to more than recall the thin harsh skin; the weished face; edentulous jaws; the smalle areas; the grey hair and bold pute with its glossy atrophic integement; the tortuous corded temporals or radials; the diminished stature and weight; the skinny, shrunken extremities; evident emeciation, muscular enfeablement, and wasting; stooping attitude and tottoring guit.

It must not be supposed that the mental decadence here sketchedout takes place without emotional storms; for wild gusts of excitementsweep over the scene repeatedly during the progress of the cerebral strophy. Such maniacal attacks are often most persistent and most obstinate to treatment. In fact, the recurrent maniacal attacks of senile insasity during the progress of cerebral atrophy are the feast oractable to treatment of all forms of mania. The long continuance of eath excitement, the deprivation of sleep, and incossant reutlessness, is often a source of surprise to the student of insanity, who would a price! anticipate rapid exhaustion as the natural entorme. Such cases naturally cause much anxiety and trouble to their guardians, but this anxiety is largely amplified by their occasional refusal of find, and obstinate resistance to compulsory feeding. The maniscal outbursts of these senile dements is often revolting from their degraded limits and otter disregard of all decency. They are fithy in the extreme; they are also destructive, and are continually removing their clothes and exposing themselves. A sexual element, also, is aften a prominent. feature in such subjects; crotic tendencies being by no means infrequent during such maniscal attacks. Thus it is that at the onset of smile inamity, ere other well-pronounced symptotics declare themselves, the subject (formerly a most moral and well-consiscted man) soldenly exhibits such crotic temfencies, outrages every sense of deceacy, and brings diagrace upon himself and connections, ore it is discovered that he is an irresponsible agent.

This objectionable tendency is one strong reason why an aged parent, suffering from such maniacal outbursts, should be received from the care of his family. On associally such authorits of excitement alternate with depression, and the following instance of scuile hypochondrians illustrates this well:—

d. A., aged staty-two, wisherer, a beloncer; a man of stronge height, and wellmarrished, with a buffet chaped head. Eight sarely coloured hair, and blue upon. Patents had lived a stordy, temperate life; had suffered from no special disconnvisionless, or —it. Had austained no injury to the head. Family history was not

assertainable. He had been wretchedly depressed for six months; but for these years proceding his admission, he had suffered from slight attacks of depression alternating with environment, and was taken charge of its the worklower infirmary wards. Six morths since, whilet in a very dejected state of mind, he spring over a bridge into the river, but was reserved and taken to the workhouse, where he has remained surploying himself at useful occupations, but afreque depressof. After an emiting religious service which he attended ats weeks prior to his arrival at the toylum, he became terribly dejected, and, at times, acutely exclusions, rushing about, everying his hands, and crying out, "lost, lost," and tried eventually be loap from a window. He was brought to the arylam in a state of great agitation, struggling wildly, and accessitating rostraint during the transit. The excitement abainst abortly afterwards; by took a burrie meal and slept well. The next meming he was able to converse calculy, and gave a detailed account of his past life. "For some years past he has been subject to periods of "confusion of thought," and failure of memory; it comes on suchbudy, unexpertedly, and at such times he is: wholly inexpositated for work. At times such attacks were prolonged and accompartied by intense dependen, during which he had to be placed under supervision. In one of these fits of desposalency be attempted solvide. He believes he is 'eternally lost; 'but his chief trouble at this time was not so much his sent's welfare, so the idea that he cannot digest his food; he constantly dwells upon the condition of his atomach and bowels, in which he refers many imaginary adments." His memory was but slightly impaired, being more sluggish of recall than notable disloctive; his intellectual operations generally were torpid; his attention enfocbled. so that occasional confusion of aleas occurred during renovemation; no hallocantions existed. He had a dejected expression. The pupils were equal and active, of normal size; the tengue was pretruded straight; and showed no stary or frence. No exhibit depostration of the superficul arteries was indicated, and the heart was apparently healthy.

Chloral above afforded him redsel, and was Imparelly required to accure absept. Thus he remained for some years with no relief our alteration of his debuied state, pacing up and down the wards with won-begone aspect, graining, important apon the original of his hypertambrical lancies; dwelling upon his "depressed spirits," "deepleasures," and "the fire that has be twenty yours burned within him. He died, were your after alternation, of poleronary congestion.

Many cases of sende idementia present for some time a gradual, progressive mental enfectionent, without any notatile degree of excitement. A constant ourcest, a mild depression, with very rague fears and ill-defined actions of coming trouble provail, often acceptated with distributions of estimate suspicions of persecution. Such was the following case, in which the ideas of persecution became more defined, and issued in parexysms of great agitation; and in which the progress of otherconstons, vascular disease resulted in a slight transitory monoplegas from pingging of the vessels.

I. it, a widow, aged severity five. Look her hashand eight years ago, and layed with her children and i removed to the worklessure, none works since, having become numerical sold in the five shift of the five size of them. She had been failing in merchal powers for man few years. At this time size was consisted and very restless, mankening about her moon sky and night, seeking her bushesst, where she believed still litted, and expressing four that the manages of the worklasses had designs upon her life. Her habits as regards

alcohol had been temperate; there was no history of invarity or other moreous in her autocolects. Upon admission dis true fairly quiet, and occurred affably. Grave meetal failure was apparent; she still thought she was at the worklouse, although sie had been here a wook; "came direct from her own home, where she had been living with her fruitual and matter in law; the latter is not old, and ake speaks of les hashand as youthful; she beself is about thirty-six years of age; har hubband lives in New Leeds; she saw him a fortnight ago." "She makes vague statements of ill-treatment before soming lare, weeps childrich; and then as radically becomes cheerful and contented. She is a shrunken old woman, much reduced in bodily condition; the last much wrakled, the complexion cartley, and the hair gray and musty; there are no teeth. The superficial arterior show no marked signs of degeneration; the pulse is 90, regular and of fair strength; no obvious usuful state of circulatory or respiratory systems approvable) usus almost colouries; specific gravity, 1900; an trace of albumin; no deposits." During her first mouth's residence here she exhibited the usual reductions of the scalle drawing, but no outbursts of earstenant occurred. Six slept soundly and took her. bod leartily, yet she was notibes, discontented, poposit, wandered about in an simber, hill-racing manner, and, when questioned, explained that her harburd was at work close by at a coffiery, and that she sought him and her son. Herhabits also were institutive; did not recognise the nature of her surrogadings; believed the was still at Clayton Workhause. About four weeks after admission she had see of the characteristic separes to which these agod descrits are subject. Whilst setting to her chair she became pule and faint, lost complements to ment anily, and the left upper extremity was found paralysed. The patient remained in a state of semi-stupor for about an hour, then recovered rapidly, and shortly afterwards could walk about readily; the purilysed has regumed its must power. A month later it is noted that "also largers her father lives here, as also that bixage and her own are the same. In these, nothing often wrops and cries to go home; is more feeble and wasted." Still later on the became polanticals, even arately not appeared in great agitation and terrified; would any aloud, "Are you going to put "! happygrebag on

The following case is one of a more acute character; the prevailing mental state being that of melancholic depression, attaining at times a degree of acute melancholic. It will be noted how the physical examination testifies to the general malnutrition, great emaciation, and to the failure in cardioc energy and advance of atheromatous change in the peripheral blood-vessels. The most striking feature in this case is the hypochondriacal state, which is not at all unusual in the scate forms of senile invanity; hideous deluzions being entertained as to the sinister intention of those with whom the patient is brought in contact. The rapid cardiac failure often leads to alarming syncopal attacks.

H. D., aged sixty-two, and married. A somewhat hall woman of very haggard, marted aspect; the completion sillers, and condition generally very anomal. Physical examination betrayed endeaded cardiac energy; the impulse exceedingly weak, the normal at bose less clear and sharp than normal, but there was no maximum. The temperal and radial vessels were nonewhat hard and incompressable, but not tertinous; pulse 96, very small and tooble. The abdonous was alreaded and hypothe delivers to ask distances, all patter delivers to a limitation of temperal and radial and tooble. The patient on a limitation, all patient is a trace of all anomals a large deposit of macus. The patient on a limitation,

was very reation and manucal maid only quinging out of hel, knocking over the buckets of water used by the surabbirs, and uportring the patients' book, declaring it to be poissand. She made strongers efforts to escape from her wird, referred her food, asserting that her body was "full up," and there was no room in her stomach for book. After a resiliest night the was knowl very melanskalle, and the subject of hypothorshineal definions. Thus, she stated that for two years part debility and loss of appetite had precalled, and she had now discovered that her spine had grown forward to us to encroach upon her elemach, proventing the enfrance of food; her bonce had grown longer and thinner, awing to a power or the water in which she bathed herself. She affirms that stars appear in the room, take shiMinkly, and falls jeto a dope. Made such remarks us-"Dun't put my eyes out; are you going to blast me? are you going to make me deaf?? Constantly for swinnshold: Sure so got the better of her at night that she could not be kept in association. with others, but had to be removed to a single raom, and a small does of chloral administract; cried out in terrified tones-"Den't do it to eight, will you? What are you going to do? you have done it long store, basen't you?" Her habits were very degraded. A neath after admission she had a score spaceped attack remained very pale and ethorsecious for some time, and the pulse became entremely feeble. She died of paramonia shortly after this date.

When mental exultation prevails it is a symptom of gravest moment and perinous of couring dissolution; the general exaltation, which is the prevalent feature in all simple maniacal states, is but the expression of a very universal disorder of function. It is the partial exaltation manifested as regards one or other of the most complex groups of feetings which comprise the seathetic or the religious sentiments, the social and the demestic feelings, the sentiments of possession, of freedom, and many others—the later developments of vivilised man-it is this exidtation which is so ominous of coming well. The sentiments are, as expressed by H. Speacer, purely re-representative feelings; a compounded aggregate of numerous recollections, vague yet massive, combined with a still vaguer part, a kindred feeling organically associated by succestral experience.* Such optimism is usually the knell of commeneing doesy. We need not here attempt to analyse such complex groups; we need only recall the fact that according to the special groupwe are dealing with there will be more or less of the emotional or of the intellectual commitment; that the higher the developmental phase such feelings have attained, the more closely will the emotional and intellectual factors be interblended, and, therefore, the less distinguishable inter se, and the more preponderating will be the cognitive elements. The cognitive element is the relational for thought is but the passage from one state of consciousness to another | it is, in Reelf. but a freeing, which is of insignificant duration, as compared with that of the states of consciousness which it connects. In the mobies tramition from our state to another, we get a more pronounced relationship; the cognitive element becomes more emphasized, and thought more

^{*} Principles of Psychology, vol. II., p. 458.

definite. Hence, the import of the fact that the relational element of mind is the first to succomb to mental disease. If, as may well be conceded, the change in the nerve-cell represents the physical basis of conscious states, and its gestoplismic extensions represent the relational nexus between cell and cell, whereby a change from one state to another is rendered possible, then our statement is tautamount to affirming that there is a failure in the freeing of the relational channels—that a greater conscious effort is required for definite thought, and that, consequently, there occurs the intensified feeling which we have already alitized to as a rise in subject-consciousess, with a corresponding full in object-consciousness. This rise in the feeling element, and fedure in the cognitive, leads readily to a delasional state, as might be anticiputed. This failure in the relational element of mind, due to some physical interruption of the molecular wave which traverses the connecting links between cell and call, may pertain almost exclusively to certain of the higher evolved groups of feelings, and, so to speak, may (by a species of morbid dissection) issue in their gradual dissolution, while the other faculties remain more or loss intact. The confusion of ideas, the detusional percersions, the indefiniteness of thought, accompanying the decay of the regnitive element, proceed pure passes with the rise in the feeling element (as exemplified in the monomania of pride, in the delusional states of general paralysis, and in the monomaniscal states of masturbatic immutty), and appear to indicate territorial implications of mind, possibly due to vascular changes. Here the question naturally arises how far this derangement is to be attributed to physical change within the nerve-fibre, or how far to interference by extraneous agencies, such as vacameter changes, ice. The nervous wass which pervades the labyrinth of cell and fibronetwork during active functionising, is normally determined thither by the act of attention; and, however we may explain this farulty (probably due to the establishment of a more rapid and vigorous circulation through the active area), its operation doubtless serves to intensify the intellectual or regnitive element of mind, and the relations between feeling and feeling become more pronounced and definits; or, in other words, thought is intensified. On the other hand, its follow not only reduces the nervous wave in volume and in vigour, but the relational mes cannot be forced thereby, and hence will casse the states of mind. already alluded to. Fullure of attention is indubitably the earliest. symptom in these states of partial exaltation. From this point of view, the feithers of attention to the primary derangement, and the morbid result contrains notably with that morbid entity engendered. ab eafer. If the holdly seniations (the compathesis) are seriously deranged; if altogether navel and obscure consistions are around by a.o., various visceral effections, it is notable that the personality may be

endangered thereby, and a transformation of the eye may result. This fundamental change may be induced by the persistent attention given to their morbid feelings so aroused feelings which embrace both the purely sensuous and cognitive elements—and overtalance previously-existing states, destroy the normal contrast, and become by this very faculty of attention intensified, and thus a morbid group of feelings is created and consolidated, which stands out in antagonism to the old self as a new eas. If sensory channels become the media for the transmission inwards to the sensorium of melecular waves of abnormal force, volume, or frequency, they will naturally arouse the sentinel faculty of attention to question their nature and relationship, and thus further aid the foreing of those relational lines which consolidate the whole. We have thus the possibility in the nervous mechanism of two morbid conditions arising, wholly distinct in character, whereby serious intellectual derangements may ensue. In all physiological parisnes we may liken them to the via a female and via a tergo of circulatory phynomena, the former, represented by the faculty of attention, the latter, by the varying ingoing currents along the sensory nerves. When the morbid transformation of the concutteric gives rise to the gradual pervading of the old by the new ego (e.g., extreme egoism of pulserty)-as the strengthening and chatorating, and integrating process advances under the auspices of a restricted attention-the definiteness of the defusional concept becomes notable, and no possibility of acopticism can arise; there is no excitement, but great mental calm.

Hence, the essence of these forms of monomania is their ponstructive nature, whilst the distinctive feature of the perversions of the exalted senile dement is their dissolution; one is synthetic, the other analytic and destructive. Exfechiencut of the faculty of nitention, therefore, evokes failure of the relational element of mind. Thought becomes obscured, and lessened in vigour and definiteness, the faculty of association of ideas is necessarily weakened; feelings are more crude, ill-defined, or poorly-demaranted from associated feelings; thought becomes less subgrent, delusional concepts are upt to arise from exaggerated feelings, and loss of the contrasting and representative faculty, and excitement prevails. In the rapid reductions of general paralysis we have seen how all those feelings which are based upon the instincts of conservation of the self, or of the progeny (together with the complex and consolidated groups making up the social, religious and authoric sentiments) seconsively become deranged; and how in each the faculty of attention is first or earliest involved. disease reproduces, in a terribly-rapid sequence, the morbid results which more gradually cause in the decay of smile atrophy; the relational element or the nerve-cell prolongation is the enrices to succumb:

Senile Amnesia. - We have already seen that the earliest symptons apprising us of commencing decadence of saind in senility is the failure of memory for recent occurrences. The latest impressions reaching the sensorium may be so imperfectly registered as to be rapidly obliterated, or they may full to establish the organic connections whereby they become more permanent constituents of the nervous mechanism. In the nexus of processes connected with, and extending around, a nervecell, we decialed the integration of structure upon which its permanence as a functional unit depends; and the more free such channels of communication become, the more fully organised in the structure, and the more stable and resistant to the engrous ments of senile dissolutions. The latest requirements, however, are expressed in the structural modi-Scations of the highest nervous arrangements where integration of structure is least advanced; and unlike those associations which have been called into activity over and over again, many thousand times, they fail in that nexus of communications necessary to their stability. Thus it becomes a matter of common observation that these senile subjects are objectors to the most ordinary events occurring in their immediate presence; they will six down and enjoy a hearty meal, and an hour after he upconscious of the fact; will meet a friend in converse, and forcet immediately both the occurrence and the conversation. If the event be recalled, its connections with his recent experiences are so frail as to end in his relegating it to his by gone history. Ribot has well described the process of recollection and localisation of events in time. He indicates how the mind, as it were, travels back along certain definite lines, not recalling the myriad of events intervening, but leaping from certain prominent stations, or, as he calls them, "reference-points," until it arrives at the desired epoch, and thus, as itwere, laying down a measuring rod which defines the two points in "Without this abridged present and the disappearance of a prodigious number of terms, localisation in time would be very long and tedious, and restricted to very narrow limits"; and again, "by repetition the localisation becomes immediate, instantaneous, automatte" (pp. 52, 53). This does not accurately describe the process for all, justmuch us the process varies much with different individuals. Thus, if we take into account those who "visualize" (in the sense in which this term is used by Galton), we find that the mind often recursinsuedistry to the event in question without apparent reference points, and that the greater or less vividness or faintness of the large visualised tends to localise the event in time for such subjects; or that the mind travels forwards from a similar reference-point to the present, so reversing the process described by Ribot. This condition of mental, historical perspective steadily declines in scuile dementia; so that localisation in sinc becomes to many quite impossible; present events

fail to impress the organisation with their wanted vigour, and hygone experiences rise into undue pressinence, rivalling in their more vivid reproduction the more recent occurrences, and become, as it were, projected into the present. This is what we might anticipate, as greater resistance is offered to the molecular currents of the highest nervous mechanism, the tide of nervous discharges must recode to the more deeply-organised structures. That the latest acquisitions and powers. suffer earliest is also exemplified in the failure of memory for foreign languages, for late intellectual operations of abstruso nature, and, in fact, for all recent additions to the individual's knowledge; the more quecialised inculador always faster siounit. So proper names are fergotten, a father may fail to recall his children by name, although he recognises such individually; or a patient, daily attended by name or doctor for years, may be unable to recall the name of either. Substantives are liable to be forgotten; as indicated by the hesitating speech, and usually a dead stop at a noun. Dr. Clouston truthfully portrays the typical sentle speech as "a mixture of aphasic, ammeric, and parette symptoms." * The decay of the intellectual is followed by failure of the sentieut element of mind; emotion and feeling become slowly impaired, but at a much later date. Still, the patient may pursue his usual course of tife, and all deeply-rooted sympathics, weaknesses, and prejudices may prevail in full force; the customary habits of a long life maintain their ascendance; and though speciel aptitudes full, the more general are still retained. Eventually, with their decline the subject is reduced to a more vegetative state of existence. The whole process forcibly illustrates the law of dissolution, whereby the most-specialised, most-complex, and least-organised nerrous arrangements suffer first, and the more-general, least-complex. and more-organised and stable nervous-arrangements are the last to snorumb; in other words, the dissolution takes the course from the least to the most stable arrangements.

The following may be quoted as illustrative of the rivid halfucinations and terror sees in these cases of scuile melancholiz during the progress of atrophy, the dangerous impulsiveness to which they are liable, and the great trouble they give in our asylums.

M. M., aged eighty-free. A widow with two clabbres, of Roman Catholic posmasses. Was attented October Eliti, 1888, under the inflicating cortificate— "Coatters about dead people whem she believes to be still bring in an empty loose close by and one of whom the talks of marrying to-day. Believes nevell to be possessed of property. Random about in search of imaginary objects. At one moment greatly distributed and crying, the next reduct in speech and conduct. Has to be constantly watched to present for distinging windows and casaling from from. Therefore is bill for delibers and burn for loose shows; attempts to strike her grand children with a poker." She was said to have been a very study women, with m. manne or epileptic inferitance; me daughter had died of favoraplysis, another of phthiat. In is utilized that such five weeks ago she showed to social decargoment. She then become excitable, disorderly, towed food down into the celler her others to feed upon a non-became quite intractable, and several times realised upon her daughter with a loude. Him been most destructive of clothing. "She has a large clothing cephalic head, a very long favor, which is extremely wrinkled and public, and a fataress expression. The hair is this and white, jives massive and prominent, few teeth remains. She is much emissated. The experient arteries show no very desided certiag; heart's action boths. There is slight polescomery emphysicans. Examination of the organs negative."

Oct. 2014, 1888 - Heatless and terrified had night; kept looking at, and pointing to, the wireless, and declaring that "Mahout, was coming to hill for."

Oct. 23th.—Very postion; incomarily trying to get out of the ward; asserts that she is "going losse to day." To have a reschare of limiters by separat with the double broadles of solines and assessment twice daily.

Nor. SA -Required feeding by the fuguet; is definited, unquiet, and speaks angelly against these who feed her. Talks much in unintelligible Irish brogns.

Do: Elect —Americ that "they are going to kill her; there are some knives with them there; them they are"—printing to the criting. In very agitated and realless; from use shop well, and grown weaker.

Feb. 2nd, 1887.—Often excited and noisy; on the 20th all, refused by distant and comarked.—'I wan't take a hip; here do I know what poisso I get?' At times lights with those who approach her, evidently in terror less they should have her. Is very facility and then; often requires a small does of paradehyd at night to some shop.

Premature Senility.—A coreful comparative survey of the foregoing histories, with the case of *H. O.* detailed at p. 243, will at once convince us that we are dealing in both instances with two obviouslydistinct affections of the nervous system. In the smile form we find the results of a general decline in the vital activities; the functions of naturation, circulation, and the respiratory activities diminished. So also the blood-stream is impaired in quality, diminished in quantity, aluggish in its flow; and when we turn to the verifict of morbid anatomy, the blood-channels exhibit diseased tunics, narrowing of their lamen, tertuesity with attendant impairment of their resilience accompanying atheroms,—the tions elements universally, and the brain-cells in particular, presenting factly change in their constituents, all indications of a senile retrogressive pressure.

The latter form (cheunis cerebral attuphy) like a us presents a notable vascular change, but of a very different nature—a compensatory hyper-trophy of the nuncular tunic of the usual resuels, especially emphasized in the corebral arrerioles, and very frequently associated with advances atheroma of the large basal blood-vessels. This hypertrophic condition is also found in varying degrees in the kidneys, being identical with the changes described in the arterial system by Dr. George Johnson, as those of chronic Bright's disease, especially of that form

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associated with the contracted kidney. The imperfect renal function is manifested in nearly all these instances of chronic brain strophy, as may be illustrated in the foregoing table, containing the results of examination of the urise in seven typical instances, followed for the contrast by a case of general paralysis (J. H.), and one of scatte delirious mania (T. R.). The ures was estimated in these cases by means of Gerrard's precenter, and the amount in health normal for each individual was obtained by Parkes' empirical formula, having regard to the sex, body-weight, quiescent, or sorive condition of the patient. When these conditions, together with those dependent upon diet are allowed for, we still find a considerable defect in the precent of area duly eliminated. Two cases out of the seven revenied albursess, and only to a slight degree.

The history of such patients points very decisively towards the morbid change being expressive of a general constitutional decangement, which we must identify with chronic Bright's disease, and which expends its farce with varying degrees of intensity—

 Upon the minute arterioles of the kinney, productive of the small contracted organ men with—

2. Upon the minute cerebral arterioles issuing in this chronic steeply of the besin.

3. Or is chiefly emphasized in the vascular apparents of the spinsl cord.

In all such cases allike we have similarly-disturbed functional prodremata with associated neurosca; in all the high-tension pulse is a characteristic indication; in all a similar effect is reproduced upon the heart and large blood-vessels.

If we contrast the senile pulse where atherconatous degeneration prevails with that of a typical instance of shronic brain atrophy, we find the former presents a tortuous artery, unsuly prominent and visibly mobile with each pulsation, giving a aphyguiogram of exceedingly low ternion, a vertical percussion up-stroke, as almost equally sudden collapse, and a frequent diministion of the discotic wave varying with the endo cardial and sortic conditions. There may possibly be a degree of cardidic deformant, with loss of normal elasticity, associated with more or less and is regargitation; secondary unstalations during diminole are usually absent.

In these cases of cerebral Bright's disease, however, the palse is small, very hard and incompressible, in fact, indicative of a high arterial tension, modified more or less by a hypertrophied left ventricle; there are also a well-marked percession-impulse varying with the degrees of hypertrophy, a well-sustained tidal and good discretic seare, often succeeded by a slight secondary undulation during the diastolle passes (arterial shaticity). In the case of extensive atheremators discove a tracing-pressure of from 50 to 50 grammes suffices, and the occlusionpressure is very low; in the pulse of the subject of chronic brain atropley the taminess is so marked that we have often to employ a pressure of 180 grammer, and with a large hypertrophied heart the persons often has to be still further increased.

The obstruction is all these cases is due to the hypertrophy of the tratics summaris. As was indicated yours since by Dr. Beoastbent," the peculiar character of the sphygoogram is immediately altered by the exhibition of south and also by the omet of pyrexis. With the atherematous condition, however, the exhibition of amyl, of alcohol. and especially of alcohol subsequent to chloral, produces such paralysis of the muscular tunic as often to result in a dangerous vaso-motor relaustion-a condition not some in chronic brain atrophy except with the association of extensive atherems.

As in the early stage of Bright's disease the chief symptoms are those referrible to disordered digestive and assimilative functionspyrosis, eractations, gastralgis, nauses, losthing of food, or a caprimous appetite may long prevail and constitute the premonitory note of alarm. Then follow evidences of depraved blood; of the hydramia associated with adventitious irritating aubstances which fall to be eliminated; the red-corposcles decrease in number, and the circulatory energy becomes impaired. Yet it is in the early prominence of nervous symptoms that we see inflicated the tendency to issue in brain linesse. All cases of Bright's more exhibit more or less of these nervors derangements, but such symptoms are percharily emphasised in the cases with which we are now concerned. Headache (aften hemicrania), giódinesa, vertiginous seixures, synospal attacks, severe palpitation, disordered sensation (special and general) are peculiarly prominent. Some subjects are dictions to overe forms of facial seamilgis, others complain of great mental torpor with assessiones or even stapes: A deranged state of the blood, as regards its quality and its supply to the central nervous system, explains to a targe extent these symptoms of disordered innervation.

Just as with the renal implication of chronic Bright's disease, the intensity of constitutional and local indications may bear no constant relationship to such other-so in these cases the degree to which the nervous courses are involved will greatly vary for early individual case. the local having no constant relationship to the constitutional. With the implication of the nervous-centres we may find associated every degree of renal and hepatic degeneration and cardian hypertrophy; but it is more satual to find the kidneys in a state of early intersticial fibrosis than very extensively affected; we usually find one

^{*} Discussion at the Royal Medical and Chinargical Science, Med. Times and the_ Dec., 1832.

organ in a much more advanced state of degeneration than the other.

The special determining factor upon which depends this tendency to implication of the cerebrum in particular, in cases of chronic brain atrophy, would appear from our statistics to be alsohol; a large percentage of alcoholic cases undoubtedly succumb to this affection. The selective power of the brain for alcohol has probably much to do with this determination of morbid activity towards the cerebral blood-scarcla. Recognising in most, if not in all, such cases, the injurious effect of alcohol upon the blood-plasma, we cannot too strongly insist upon the importance of defining the constitutional as spars from the local decangement in the earliest stages of this affection, and of atonce treating such conditions with the object of evading the local implication.

THE TREATMENT OF INSANITY.

Contents Physiological Element in Treatment—The Moral Element—The Moral Name—Ladrochusined Treatment—Hospitals for the Acute Insice—Modern Elementaries in Treatment—Rest and Elementary Treatment of Delimete; Destruction Halota; Seculal Tendencies Therapeuties—Elle of the more Important Solations Employed—Chloral—Chloral—Delimine—Parablehyd — Solyhonal—Triconi and Tetronal—Hypnopamine—Dubnine—Opine—Cancabis Indica—Cancabis

The treatment of inantity naturally resolves itself into (a) Physiclogical or Hygienic; (b) Moral; and (c) Therapoutic Measures.

It is necessary that we appreciate the implication of these terms, just as we must recognise that a strict classification under these acadings cannot be always logically claimed for any special line of treatment adopted; thus, the physiological often includes a usual element, the moral often has a notably physiological operation, whilst the therapeutic again has, under certain conditions, an equally strong social effect.

The Physiological Element in Treatment.—By these measures we seek either to convey the organism into a more suitable environment, or so to modify the existing environment as to reduce to a minimum the friction established between the two; in other words, to favour, by the removal of certain agreement inimical factors, the healthy and normal adaptation of the organism to its environment. In every sense humanitarian principles guide as here, and the law of the invival of the littest is recognised, only to be opposed and combatted by the full force of modern altruistic measures.

All sources of invitation to the organism, where detected, much be removed, whether these be physical, mental, or both conjoined.

Exhausting occupations, mental strain, especially with worry and coincident anxiety, irregular habits of life, and local associations which are recognized as tending to foster a feeling of astagonism to the environment; all these should be met and combatted, and this, as in well known, can, in by far the larger number of cases, only be ensured by the removal of the patient to fresh surroundings, by planing him where the conditions of life are simpler, and where hygienic considerations are stringently kept in view.

Just as we strive to remove all sources of irritation, so we endeavour to eliminate such nexious agencies as by self-indulgence, or by the infloence of injudicious friends, have entered into the vicious surcle of his life—alcoholic indulgence, the morphia, chloral, or sensine habit, sexual excess, morbid excitement of any character, solitary habits, and morbid introspection. Wherever the organism is exposed to peril, as in suicidal conditions, extreme violence, absolute relical of food, long continued and complete steeplessness, the physiological factor is treatuent plays a conspicuous rôle, since the removal of the patient to an asyluse or loopital is then almost invariably demanded, if only to secure the full surul and therapeutic effect of treatment.

The Moral Element in Treatment,—By worst treatment we refer exclusively to the direct effect of mind upon mind, whether this be of the nature of a scothing, calmative influence, or of judicious repressive treasures adopted towards any vicious or dangerous tendencies upon the part of the patient, in other words, the psychical environment is no modified as to induce a healthy response, and encourage normal adaptation. The physician here largely depends upon the nurse, the constant companionship of a minute attendant in the sheet-anchor of success. Here it is, also, that a strong contrast can be drawn between the small bospital and mental nurse. We must admit that the intelligent, responsive, and successful mental nurse has a far more complicated sphere of labour to engage in than the nurse in the medical and surgical wards of a hospital.

(a) The Mental Nurse.—It is not so generally recognized by those who interest themselves in the furtherance of nursing schemes, that, whilst the hospital nurse is totally incapable of taking charge of mental cases from lack of experience in so special a department, the asylom nurse, on the other hand, if well trained, is fitted for hospital work, whilst her experience in mental nursing makes her a most invaluable adjuste to the usual staff.* The nurse who can enter

^{*}There is a said lack of the compensative special letwint these two classes of Institutions, stronge as it may appear, and, perhaps, not the least important chatanic to a reference to this discretion lies in the absolutely untrathful suggestion to finally indulged in by those who should know better—vin., that the asyluminative is a new record transmissed for hospital work and not certificated. The establishment

most closely into the mind of her patient, who can probe her feelings with instinctive readiness, and adapt her resources to the varying moods presented, in, indeed, a valuable snailiney to the medical attendans. A quiet, calm, gentle demonsour, free from the least flurry, a constant cheerfulness and teightness sursified by any of her patient's vagaries, un absolutely oven temper, great patience and forbearance. are indispensible requisites. The nerse should be self-possessed, but not self-assertive; aboutd exhibit a firmness suited with gentleness and the quiet self-reliance topot alone of a ripe experience, and a complote faith in the virtue and efficacy of patience conjoined with sympathy. A watchfulness ever wary, yet inobtrasive; a studious regard to all her patient's susceptibilities-nervousness, irritability. re-resease, despendency-meeting every varying phase with its saitable corrective. This is a function demanding the highest social qualifications a nurse could be required to exhibit, and, as might be expected, the soman in this rapacity is far more move-ful than the male attendant. These, then, are arms of the qualifications demanded of a good mental narse, and if such he required of a narse in charge of a mast case, how much more complicated becomes her role when placed in charge of a large ward, where she also has to encounter and control the actions and interactions between a number of patients all varying more or less in the special treatment applicable to each case! It is in this capacity that her tack and address will be best displayed, as she has not only to keep a watchful expersision over her patient's welfare, but also to control and train a subordinate staff of nurses, and to strive by her influence to spread a spirit of locality and dissipline amongst the junior nurses.

The conscientions discharge of such functions entails a lawsy bender of responsibility, demands a healthy physique to stand the steam, and involves upon those responsible for the employment of such nurses the duty of providing them with adequate rest, recreation, and wellregulated and substantial diotary.

(b) Individualised Treatment.—The whole aim of moral treatment is that of individualising the subject to the fullest possible extent; such case must be treated upon its own conits, to obtain the best results; such patient must receive as much attention as the physician and nume can benow. Here it is that a great standling-block presents itself to the alients in charge of our large asylums, where the vast accumulation of the chronic insume paralyse his best effects. The large proportion of

by the Motics Psychological Association of equationations by optificates in partial curring, (10) the ambeliance and surving classes hold new in all British mylums, is of source a soft-sent relations to this most expect aspectate. That the grather and the production fully approved to the higher fractions of the montal source in actuated by the higher soils asked for her services and so readily granted. the chronic and incurable class in our asylums require no such elaborate system as is provided necessarily for the minority—the recent and acute. Attempts have been made to obtaining redress for this condition of things at the hands of the Union authorities, it being suggested that large numbers of the incurable and harmless might, with window, be relegated to the large union informaries, which, if somewhat better officered, might, at a much reduced rate, support the great bulk of the chronic residue. The attempt has, however, not met with encouragement, and it is more than probable that our Councils will eventually salve the question by landling asylums upon more economical principles for this class of the insune; and by erecting hospitals for the acute and recent in connection with each large county asylam : this appears to be the more rational solution to the problem. The hospital should be built upon the most approved executife principles, and should embrace an administrative block capable of meeting the fullest demands of modern treatment. It should afford faculties in the form of laboratories for scientific research at the hands of the medical staff; and should som at being a centre for the teaching of psychiatric medicine, since our asylums alone embrace the material for such studies. Into this hospital should be received all incoming cases. of manity, these recognised as chronic and incumble being at once drafted off to the larger institution, and those above retained here who present hopes of final recovery or such relief as is compatible with disclarge to their homes. No districtions would thus occur to the medical and nursing staff by the multitudinous and importunate demands of the chronic class, which, at present, as largely emilars their attention and limit their utility for the real work of asylum life. All who have had any practical acquaintance with the insane must recall cases where the difficulty of segregating, so as to remove certain acute cases from the inflaence of irritating chronic potients, retarded recovery; and where the want of more individualised attention aspeared answersble for the gradual scritting of each cases into secondary descentia; nor is it a rare occasion to see a notable change. for the better effected in such cases when transferred to other wands, where the sources of amonymore were fewer, and where the nurse was able to afford more continuous saturation, or was better adapted for her duties.

Therapeutic Measures.—During the past quarter of a contrary the treatment of immerty by therapeutic measures has undergone a complete revalution. Three decades ago antiphlogistic themics will maintained their ascendancy over certain minds, and depletion by bleeding, either fancet or leach, active purgation, powerful drugs, especially the terrarated antimony, were all in vogue. Excited patients were often kept for days together on the verge of narcools. eroten oil and tartarated antimonial cintments were vigorously relabed into the scalp, and this was considered an heroic and consistent scale of treatment. All this is now altered; not so much, perhaps, by the demonstration of the inutility or even netively injurious results of these procedures, as by our growing acquaintance with the structure and functions of the nervous system, its physiological chemistry and pathology. And thus, as with the death of all old systems, a healthy scepticion of such treatment arose, not by any critical exposure of its viscous nature, but by the general advance in various departments of knowledge.

The reaction against such heroic measures had, so its fundamental conception, the nature of imanity as a reduction both in physical and in mental vigour; and, as a necessary corollary, the employment of means to held up an exhausted nercous system, and above all things to avoid lowering the vital energies of the fabric. Yet, as in all such reactions, the suggical spirit often appears to have carried some of its votaries too far, their feith in all medicaments being so violated that they are even prepared to affirm that all alike are meleas. On the other hand, old systems and habits of thought die hard, and, even now, we have faint revivals of these old-fashioned views afforded us, if not to so serious a degree, at least to an extent that is often open to centure; thus we still hear rest in hed strongly deprecated for once of excitement, although it is almost universally admitted by the most experienced as a powerful agent for the reduction of excitement and the renavation of the nervous system. And thus we find at the present time extreme views held still by a few, the more rational line of treatment lying, at is usual, in the golden mean.

Rest and Exercise - A very large proportion of the patients consigned to our asyluna in the early days of treatment imperatively demand rest in every form in which it can be enjoined. To place a recent case of acute excitement assuigst a number of others similarly neisy and heisterous would be the height of absordity and thoughtlessnew; just us it would be to insist upon the attendance at a dance, theatrical entertainment, or concert of a patient plunged into the abject mitery of melancholia. For all recent cases rest in bed is one of our best adjuvents to treatment; the electroness, the irritation of removal to an asylum, and the various unfavourable circumstances to which the patient has been exposed call for immediate rest, soothing influences, quiet and even a darkened room. All recent cases of an arete character are wisely retained in hed for at least two days after afinitation; we invariably, if practicable, make a careful examination into the mental and leadily condition on the second day. All cases. sufficiently conscious are thus brought to feel that they are captored to a rational system of treatment. It is then decided whether further

rest in bed through the day be desirable or not, and, to a large extent, the reply depends upon the patient's physical condition. In a large number it will be found advisable to keep them in bed for at least a part of the day for some little time; and to encourage meanwhile the reparative processes which have probably been much neglected prior to their arrival. Debilitated and sends subjects, maniaral or restandable, reducing food persistently will thus often imperatively demand seet in bed throughout the day; and so the turbulence of acute excitement in exhausted subjects is far better treated in the quiet of a side room than exposed to the irritation of other cases in a day room. In such cases, to enjoin out-door exercise indiscriminately might occasion much harm and would certainly projudice the recovery unfaccurably.

In the large Berlin State undown this line of treatment is followed; and especially at Dalldorf, which, to our mind, reflects the most advanced and rational aspects of modern psychiatric medicine in Germany, it was pleasing to note the genuine hospital character of the treatment adopted. Dr. Keenig of that institution kindly favoured us with his views on rest as an agent employed by himself and other alterists in the early days of mental discuse. He informs us that all recept cases are kept in hed after admission for menty-four fours at food with the object of calming excitement, impressing the patient with the Sequiral nature of the treatment adopted. On the second day, some are allowed to leave their bed; others are kept at rest therein for weeks or even months unless they resent the treatment; when it is medified in accordance with their wishes. Dr. Koenig insists upon the necessity of adequate out-door exercise where this can be borne; but he by no means intends to indicate its indiscriminate application to all cases of excitement; his plea is one of moderation, and he strongly repullates extremes in either method of treatment. We agree with him that it is often of service to take certain cases of recent excitement out for an haur's walk, subsequently allowing them to return to hed rather than to remain up among their fellow patients.

It is, we think, quite wrong to adopt any absolute rule for the exercise and rest of recent cases; each rase must be treated on its own merits, and the individualised treatment nowhere indicates its value no emphatically as in its application to the exercise, recreation, employment, and rest afforded to recent cases of issunity.

That the surplus energy of the maniso should be carried off by acvere manually exercise is a doctrine which, in recent cases at least, may be carried to a very dangerous extent. In fact, the explosivement of recent manis and reclampholia, as due to certical instability, and the withdrawal of higher central indicates a demand for the concernation of energy so as to lead it off by channels directly subservices to the use of the organism; and by quiet, by neurothing food, tonic regimen, and

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complete physiological rest to improve the nerve tone and sentral scability.

A nother fallacy which is introduced by extreme views upon exercise is recent insurity is that the boisterousness, noise, and strugglings of the scate manine serve so far to demoralise the orderly discipline of a ward and the domestic comfort of the immites, that the resort to evalutives is likely to be adopted, where, otherwise, they would not be given; in this case, the scalative becomes a form of chemical restraint and is seech to be deprecated; infinitely preferable is it that the patient should be isolated under such conditions, thus that we should be driven in recent cases to employ scalatives for such a purpose.

A difficulty also arises from the accumulation in our wards of the excited chronic class, some of whose are at times interly unfit for associating with the recent and arate inmate. According to some extremists, these patients, hepolessly insure as they are, should be kept in association with others, however excited and noisy or violent they may be, rather than be isolated for their prolonged purceyons of excitement. To this doctrine we can never subscribe; fully recognising as we do the vicious nature of isolation carried to an undue extent, we must distinguish between the hopelessly incurable and the recent case; and we sesert that the injury thus inflicted upon recent cases by the irritation of such associates is incalculably greater than that arising from any temporary isolation of the chronic class during their most protessed outbursts of manis.

Amongst chronic cases, it is teur, excitement may often be met by employment and vigorous exercise; but, even here, we must differentiate between those who suffer and those who do not suffer from physical disability, from eardier affections, or serious cardio-vascular degenerations as frequent amongst these cases.

Defences.—It is a fully recognised principle that delusive beliefs and atterances are never to be not with directly adverse criticians, and on no account is the physician or the nurse to oppose them by hostile argument, but rather to ignore their existence, or at most to refuse quietly but firmly to admit the delusive statements made. The attention of melancholic patients tend to be far too engrossed by their delusive beliefs and hallucinations to permit us to further emphasise these states by encouraging discussion on the subject. The primary object of the nurse should be to divert the attention from all such themses, and to employ the energies in directions beat likely to foster self-engrossment, and loost up to recall mortial associations.

In this way we often find that association with other patients does far more benefit than the isolation necessitated by a single charge. The thoughtful nurse will encourage all that tends to distract the attention from any painful theme by directly encouraging a healthy. inferest in their fellow patients, their assistance being cought for wherever it can be legitimately accorded. To the cocial nexus established in this way under the comparatively nevel obscuretances of asylano life in our words, is to be attributed much of the improvement which occurs in cases of inclancholic depression and delational perversion. In eliciting the delations of the image for clinical purposes, it is, therefore, wise to forego frequent discussion on the subject, and these remarks apply especially to such delations as tend to become fixed, and those which show an early bandency towards systematisation—e.g., adolescent insanity, the melancholic delations of the climactoric period, and those of alcoholic insanity.

In the former, solitary and visious labets must expecially be prevented, and whorever possible, association both night and day is to be strictly enjoined with the object of correcting or suppressing such habits, which lead most certainly to hallscinatory conditions with all their persistency and for reaching consequences.

If, however, we recognize the primary systematised form of intanity as the evolved psychosis, it matters little whether the delusions in the subject theme of conversation or not, the delusional perversion will steadily, but surely, progress to a hopeless termination.

Destructive Habits.-Destructiveness in the insune may be the outcome of pure wanton mischief, a leve of annoying others, or the act of a passionate outleast, such as is so frequently seen in the epileptic or congenital imbecile; on the other hand, it is very often the outcome of muniscal reductions, indicating the outflow of superabundant energy, and so, likewise, is the restless excitement of dementia, whether senile or paralytic; lastly, it may be the result of saiden incontrollable impulse after epileptic and alcoholic reductions, and especially in the insanity of early childhood. Thus the dementia of general paralysis is frequently accompanied by the destruction of clothing and belding during surcausess of excitement; epileptic furor, following upon epilestic solutes, is often accompanied by extreme descruetiveness and other fangerous symptoms of a purely impulsive nature. As illustrative of the destructive impulse may be quoted the case of an adult male, a criminal lumatic, who would, ever and such, he found in his call stark maked, with all his ciething turn to shreds at his feet. On being questioned as to his metive, with a stilly half-vacant somic hewould reply, "I don't know; I suppose I must have done it." He was seen found to have had an attack of petit mal, and, subsequently to his removal to an anylum, he would, without any apparent cause, epidenly turn cound and strike anyone near him full in the face, When administed, he would affirm with a complacent smile that he could not help doing in. His condition remained unecerected after

several months' treatment, both moral and therapeutic, and was purely the outcome of the epileptic neurosis.

The incorrigible destructiveness of chronic music is also a source of

much annoyance and outlay in our large asylums.

When we are dealing with mischievous and possionate outbursts, moral treatment is a powerful adjunct; the threat to suspend all. indulgencies will alone suffice in many cases to arrest each tendencies. The change to another ward, with the moral effect of new companions, may effect the same result, and the isolation in bed with some but indestructible clothing will prove sufficiently deterrent in other owns. In the destructive tendencies of maniscal excitement on the other hand, moral means are of little avail. The constant persons of the nerve, her from and repeated interference with such habits may be of avail in some cases, but in the majority it is found absolutely countial to supply the patient with strong indestructible dress material and bedding, including well-padded ticking rups, whilst the clothing must be so secured as not to be readily removed or loosened by the patient. Locked basts are also essential for those cases occasionally. The impulsive forms of destructiveness such as occur in epilepay and alcoholism will likewise derive but little benefit from moral treatment; extreme vigilance will have to be exercised, whilst the treatment proper to the convaluive neuroses is being furthered.

A form of destructiveness, found not unfrequently in melancholic states, and also in certain cases of dementia, is that of pulling out the hair from the head till patches absolutely have are found, or the whole scalp is left build. Some patients will pluck out hair by hair, and, if not corefully watched, will smallow each; large accumulations have thus occurred in the atomach or intestinal tract. Bliots will occasionally do this; and we recall such a case where it was curried on so stealthilly at long intervals that a large mass of hair, agglatinated by muous, became impacted at the pylocic orifice of the atomach, and led to a familier unit. In such cases we have no better resource, upon the failure of moral annales, than to adopt restraint, which is here fully justifiable.

In chronic melancholia, again, we often find the querulous siscontent express itself in such destructiveness; the picking out of threads, the tearing up of seams in the riothing, or the ripping open of the heldathen. Here much can be done by the soothing influence of the nurse, who will endeavour at the same time to repress such habits by distracting the attention into other directions. When the

^{*}A similar case is recorded fully by Dr. Cekheld, The potient was an epilopsic diet, and the difficulties of detection, diagnosis, and the post-marten conditions were almost identical with our own case. Journal Montal Science, April, 1996, p. 32.

symptom is the outcome of the abnormal flow of energy, as in most cases of excitement, active muscular exercise out of doors, under the charge of one or two nurses, will do such to arrest the tendency; excitement will thereby be often much alloyed, and on the return of the patient to the quiet of her room, a refreshing sleep may result.

Suicidal Tendony.-This tendency manifests steelf in such varied forms, and the means sought for the accomplishment of the act are so diverse, that it is not to be wondered at that our efforts are thwarted at times, despite the facilities which a large asylum usually commands for the observation and control of the subject. The negative feeling prompting to suicide need be by no means profound; in fact, it may only occasionally assert itself as a port of slight intensification of the preceding depression; or the subject may affirm that, when the feeling arises, he has not the nerve to accomplish the set. It may be commantly present and carefully concended from the medical attendant, or it may prove only too evident in the fixed, hopeless and painful expression, and the furtire glance, and the incessant resilesness, which are only too well recognised by the experienced observer. It may display shalf by determined and constnet plotting to accomplish its object, with critical periods of desperate efforts; or, again it may peave purely convulsive and puroxysmal in nature, following upon an epileptic seizure, or during the "horrors ' of delirium tremens. It may assert itself in long-continued refound of food, violent resistance to formble feeding, kept up, it may be, for weeks and mouths together, and often with attempts at inducing regurgitation after foreible feeding. It will be readily admitted that under these varied phases the treatment must be adapted to the individual case. It might be thought that, in the majority of cases of determined spicidal tendency, moral inflaences would prove of little avail. As a fact, bowever, this is not the case, and experience teaches un how wonderfully leneficial may be the influence emanating from a cheerful, sympathetic, firm, and officient name. The rapid change which often takes place in these melancholic patients, when removed from infinited influences to the care of a parse emixed with tact and discrimination, is one of the most surprising and satisfactory experiences of asylum treatment.

It has been stated by Moraelli, and noted by others, that certain classes of the population adopt almost invariably the same suicidal methods. It is so also to our insure community; certain individuals always choose by preference the same methods for accomplishing the deed; hence it becomes essential to learn, as far as possible, the former tendencies of our case, and for the nurse to choose excefally wint are the special morbid proglyrities of her charge. In all cases alike, it will be well to remove at once all possible sources of perilage, accessors, knives, needles, cord, matches, &c.; it may be necessary

to remove false teeth, and in desperate cases to out the hair short, or remove anything that may be used as a ligature. The windows must be accured, so that no danger from precipitation need be feared; the open fire-places may need a grazed, but the constant presence of the nurse must be chiefly relied upon to secure the patient from the risk of her impulses. It should always be remembered by the nume that her sempathy may be prindirected by constant reference to her patient's painful mental states; as in delusional states, the depression must be more or less ignored, combatted by a constant theerfolness. every effect being made to induce an initiative on the part of the patient. We have thus found good results accrue by affording such vabjects the means of inviting and entertaining patients from other wards, and playing the rife of hostess for the nones; any ench device for distracting the attention from the prevailing egoists must prove beneficial, and every sign of a returning initiative may be welcomed as of good onen. Despite the close observation thus enjoined, it must invariably be the rule that the restriction of individual liberty should be as inchtruitye as in compatible with safety; and as seen as good reason is afforded as for assuming that the suicidal feeling has list its hold, we should not neglect to indicate to our charge our returning confidence. Unnecessary restrictions too long prolonged are injurious in as far that they both irritate and tend to destroy the growing self-respect and assurance. With respect to contertainments carried out on an extensive sale, our experience is not altogether favourable; for the chronic residents of a large asylum the frequent dances, concerts, theatrical enterminments may nerve well to relieve the fedicio rife; but as an auxiliary in the treatment of arise insasity, such means must play a very reconsary part in the furtherance of air name. If their ells here be canadered fairly, we should arrow that in many cases of depression they are decidedly injurious when indicaramentately employed; that they often impairmore suffering apon the rabject; and that, in most mataness, they are more lapeficial in the later Mages, when returning interest in their agroundings indicates that convalencence has set in. We are strongly of opinion that we cannot too carefully individualise and select our miterets when the question of entertainment comes to the fore. In like manner, the who physician will very carefully consider the advisability of permitting attendance on religious services, and cautiously note their effect when they are permitted.

Treatment of Depression.—The diet should be nutritions and unstimulating; alcohol is unnecessary in most cases of mental disease, and positively injurious in explosive states and in epileptic insusity in particular. In all forms where diminished control results in morfod impulse, of the minute of obsessions, alcohol is practically contra-indicated. It is of value where cardiac energy is greatly impaired and exhaustion imminent, as e.g., in persistent refund of food, but even here it should be given in graduated doses according to the reaction of each individual case; it is of value where depressent drugs, such as chloral, have to be administered despite a failing heart and impaired circulation. In long continued melanchelic agitation, with aleephooness and sunciation, its use is often imperatively demanded; in such cases, no one can dissent from Lauder Brunton's view that it is a food in a pertain sense; it economies the proteid metabolism. With the same object in view, we should insist on a due supply of carbohydrates in the food, as tending to restrict proteid transformation. In simple cases of melancholia, where there is little tendency to tissue waste, our attention will be chiefly directed to maintaining the appetite, relieving torpor of liver and howel, and enviring that the digestive and samulative functions be duly performed, whilst we add to the dietary such elements as are obviously indicated by the patient's condition, such as iron, arrenic, the compound phosphates, cod-liver oil emulsion, and malt ex-SPACES.

It is worse than meless to give our subject a surplus of nitrogenous food over and above his capacity for assimilating it; we dare not violate physiological rules so far, otherwise we load the bowel with decomposing food and add to our patient's misery. In fact, by sodoing we disorder nutrition at its fountain head, and render nutointexication a very serious probability. An abundant milk supply should be our staple article of diet; fish, mest, eggs should be given liberally, with a varied vegetable diet at regular intervals and with discretion. Where resistance to food occurs, compulsory fielding must be enjoined, but only after every effort has been made by tact and kindly persuasion to induce the patient to take food volunturily. Obstingte refusal must be met with determination and vigour; three meals a day should be given forcibly, and, in very exhausted states, a tourth feed may with advantage be given late at night. It is he no means unusual for deladed subjects to receive willingly from the medical attendant or night name what the day attendant failed to administer; and, occasionally, a patient will take by stealth what she obstinately refuses when offered to hos. The question of removal from home of maid forms of depression will depend chiefly upon the acetal circumstances of the family; if the means are feetheening, a private nurse may be engaged with advantage, but, even then, association with the friends is not admissible. This is one reason why residence away from home or travelling in single charge is often magnitud. Even with suicidal tendencies, single charge, under a thoroughly competent surse, is not negatived.

Repression of Paterty.—Hysterical symptoms in pulsement girls often assume a suicidal feature; usually the feeling is obtainingly emphasised; there is a morbid plea for sympathy which is by no means necessarily genome; removal to an asylum under these direction stances would often be felt as a lasting diagram, and extreme delicacy must distant to the medical attendant the proper course to pursue. Travelling in single charge or residence away from briends may be enjoined here with advantage; but, it will at once be seen that the power class cannot affect the cost which this implies, not must fall back upon asylum treatment as the only resource. In each cases, the tast and ability of the surse will be tried to the utterment.

Neurothesis and Deprenies. In the case of certain permethenic subjects, the ordinary social obligations and conventionalities of life become not only burdensome, but a source of constantly increasing irritation; it is eminently mewise to insist upon these functions under such circumstances; much harm may be done thereby, and great risk run. The relatives will after strive to induce the sufferer to overcome his accupies by insisting upon attendance at religious services, public ammenicuts, or even by the performance of public functions, despite the fact that he regards it in the light of mental tocture; such a stocal dectrine is, to say the least, irrational. A wise attendant will at once remove all such sturces of amoyance, will lead the mind into other and more congenial channels of thought and action, and, only when reterming health demonstrates increasing adformarance, will it be wise to suggest a return to former conditions of life; even then the suggestion should be so framed as to appear to be the patient's own desire.

Melanciely soil Stapor.—Apart from the general principles of treatment above noted, these cases will derive much advantage from the administration of baths—electric, shower, and spinal douche; whilst masso-therapeutics, shampoong, with the application of the constant current to the scalp may be conjoined with advantage. These cases, of course, demand great care and watchfulness to secure a due amount of nourishment being taken, and to ensure the regular scalan of the towel and the emptying of the bladder.

In all cases of depression we embayour, if possible, to secure intural cleep before resurting to sedatives; but delay is desperous in acute melancholia, and the symptoms are grave from the outset; the persistent reliant of food, the absolute insemnia, and acute depression, entail such rapid wasting and exhaustion that we cannot be too prompt in securing alsop even at the cost of sedative irrainant. Food must be given regularly, and, if necessary, with force; and, as in the case of arute delirious mania, the patient must be treated from the first as an invalid in a perilous condition. The removal of all

tources of irritation, absolute quiet, a darkened room, free ventilation of the lick room, a cool equable temperature, cleanliness, order, a quiet, from and closerful demeanant on the part of the nurse, will all tend to influence the putient's mind, and to induce the natural repose required.

The depension occurring at the climateric and during factation, if of a mild character, may often be treated at home, or away from home with a suitable nurse; should solcidal promptings be strong, however, removal to an asylum will be most judicious.

Transment of Eccitement.—Most cases of excitement are still more unsuitable for home nursing than is the one with depression; mild hysterical forum and very early outbreaks of senile immity, as also prespected and gestational forum, should all have the benefit of home treatment when this can be conjoined with good nursing and safety. The dangerous impulsiveness of purposal subjects render them the more anxious class to deal with in this way; yet it is possibility desirable that a trial should be made are resorting to the severe procedure of anythm supervision.

Published and Adolescent January, -It is wise to resort to early removal from home in these subjects; apart from the necessity of breaking through associations, which often tend towards festering as atomatised delusions, we have to shield the patient from the results of his own victors habits, and from the dangerous impulsiveness towhich he exposes burstelf and his friends. In this form exercise and employment are of vast importance, as is the case with all resurrent seigures of youthful subjects; they aid in warding off self-contemplation, brooking and mornid feeling, the nursing of delesional nations, and the ill effects of ballacinatory states. Order, discipline, and regularity of employment do much for these cases; whilst a natritive anatimulating diet, cold shower boths, and open air exercise are potent adjuvants to treatment. Perhaps in no mees is isolation in victors as it is here; it is equalled only by association with the elevnic imans, which is enforced by our modern methods of overcrowding and defective classification. Mimicry is rampart in these subjects hence, the moner they are brought to employ their cuergies in meful out-door confloyment which distracts their attention, the better. Assumements, social gatherings, games of chance and skill, and athletic sports should all he encouraged in these subjects, who otherwise spend their existence in isolation from their fellows and in morbid brackling.

Excitment of General Paralysis.—We can only deal with such once satisfactorily with the complete armamentarium of an asylom at our command. The publied room is often required to obviate self-injury from blind and almiess violence, and to secure them from the injuries which manual inserference would so often entail. In advanced cases

maisy, struggling, degraded—the single room is an absolute necessity, as is also the hed upon the floor to obvinte falls. Wherever noisy excitement is not so great a feature, we may resert to observation night and day with benefit. Great precentions must invariably be taken to avoid fractures of the ribs and other bones, which are preternaturally brittle in this disease, and other in a state of catremo outco-porosis. It is scarcely necessary again to call attention to the samper of bed-steen in these subjects, to the risk of overlooking a distensed and paralyzed bindder, or to the treatment of destructive habits so prevalent in this disease; the principles already enunciated should be strictly followed out here (see Destructive Hobsts).

Somic Excitement.—Much that has been said as to general paralysis applies to these cases; we have here to deal with fremied excitement at times, associated with great debility, often with serious cardio-tascular affections, renal degeneration, and all its accompaniments. Only in very mild and early cases can we hope for success from treatment at house; the pudded room, the single room, or constant observation, and the frequent attention of the medical attendant are imperatively called for in all serious cases. For the incomnia of semile manis, chioralamide and parallehyd may be given with hereal; the latter preferably where digestive troubles are prevalent (see Frentsees), p. 477).

In the later stages of semile decrepitude where excitement has been replaced by mere restlessness, or apathetic dementia, entimary principles must guide our treatment, and, above all, is it important to give a due amount of rest, and to intervene secondonally where also holic stimulation seems desirable.

Alcoholic Ecoicescut.—In the nexts can debrile form—mania a-porn, or nexts alcoholic desirium—the cannaig, treacherons, impulsive violence, the deliminated comparing and persecution, are the features ever to be borne in mind, and they must be treated on the general principles already commutated (see Delamina, d.c., ours). The excitational and intermine are best met by chloral, which is also our sheet mean and intermed are best met by chloral, which is also our sheet anchor in the treatment of the febrile form of alcoholism or delation tremens. Dubolskie has been given with success, but triousl sheary fails; nor can we trust to committee for good results, nor yet to bycocynomics, which relieves the excelement of chronic alcoholism (see Teorgical), p. 480.

Therapeutic Heasures,—The treatment of immity by drugs, electricity, by drotherapeutics, and other measures rests as yet upon an amatisfactory basis, in so far as it is to a great extent pullistive only, and, at the same time, empirical. Our remedica are very largely applied to the treatment of assec symptoms, or we endeavour to establish natrative equilibrium; or, again, we attempt the removal of such disordered functions in other organs than the kenin as may be

regarded either as the direct outcome of centric disturbance, or even as the possible exciting came of the mental demagement third.

It is too early as yet to have our tembered (as many have done) upon an assumed connection of mental derangements with various viscoral disturbances; and though the latter afford indications for treatment, we are far from recognising this principle as the basis for a scientific treatment of the mainities. As we learn more of the spencies which affect tissue metabolism; when we can follow more clearly the products of such activity—constructive or destructive—or, when we awake from our ignerance of the torines which pathogenic organisms may develop in the system, we shall be nearing a time of rational therapeutics. Physiological chamistry must therefore lead the way towards this scales of consummation.

We shall not attempt here to do more than merely indicate the rife of the more potent remedies used in the treatment of insanity, the greater number of which are, of course, sedatives and hypnoties. An attempt to treat of the applications of electricity, baths, massage, &c., would unduly extend the space at one someand, and we, therefore, proceed to enumerate the shief remedies employed for the treatment of immunia, excitement, and depression acting in the source of mental disease.

Chlorel Hydrote.—The role of chloral in inamity is chiefly limited to the treatment of alcoplement in scute insanity, delirium treasent, general paralysis, and the furor and convulsive sciences of epileptic inamity. Its continued use in acute maniscal attacks is to be deprented as highly prejudicial to ultimate recovery, but in acute melanchoic cases it has proved most serviceable.

As a hypnotic we, of course, possess in it a most valued agent, and in all sompulative cases of excitement, such as alcoholic, epileptic, and the excitement of general paralysis, we find it invaluable. In sense cases, however, its rid is far more limited, superially with wellmarked asterial degeneration and cardino debility. In these latter instances it should never be given analogided by a sympathetic stimulant, such as atropine or alcohol. Given in these cases with stimulants, however, it is upt to produce severe headache next day, although the powerful odour of the breath indicates that rapid elimination is induced. In all cases where we recognise cardino debility, diffusible stimulants should be combined; but it is wise to discard its use for other hypnotics where there as arterial degeneration, valsular disease, and a tendency to renal degeneration. Undoubtedly, it is of value in melancholia, not for continuous use but for the incommis, especially if the latter results from aural bullecinations, and where these prompt to desperate suicidal attempts. In the agitated form of melancholis we have seen much benefit accrue from

its use when combined with beamiles and administered thus two or three times a day, of course, in moderate dose. Here refusal of food will often present itself, and forcible alimentation may be required in addition. On the other hand, it is unders in deliminal forms of metanchelia where the delimin prompts to the forced abstinence; and in acute mania, except that dependent upon general paralysis, alcoholic insunity, and epilopsy, we should reject chloral, except as a hypnotic for occasional into.

We have already allusted to its use in the gentle excitement of G. P., with evidence of much cerebral excitation and grinding of tooth; here very manifedness are most valuable. The rubbing off of the bair, the boring of the head into the pillow, the heated malp and flushed face, and the tuning of the head to und fro, often accompanied by a sharp ory, all seem to in to indicate its use. In like manner it may be given in the reallessness of chorsic imanity with and other heads.

The see as a hypothe is also fully justified in chronic alcoholism where delinious of persecution and arately pointful arbitrary halliminations render sleep impossible. In delirious tremens it is certainly our sheet anchor. It is far perferable to opins, and should be given in a full dose so as to obtain a long and refreshing sleep. Over and averagain have we seen the test remits ensue from this treatment; the patient awaking from his stumber a new creature, rational, confident, free from halluminatory states, and practically in his right mind. In fact, feeding and chloral are the chief agencies to be dependent upon. The great less of beat after chloral administration should always be borne in mind; unless care be enjoined to prevent exposure, paramonia is very apt to supervene in delatinated subjects; and it should specially be enjoined upon the name that all patients taking chloral at night must receive extra attention in the way of clothing when out-door exercising during the enouing twenty-four hours.

The extreme value of this strug in epilepsy during the furner, or for averting convalsions, or for the treatment of the epileptic status has already received attention at our hards (see Epileptic Tournity), and it remains only to observe that obloral will shock the convulsions, whelly ar in part, according to the dose administered; a small dose will stuply wedlift the discharge in its spread and intensity, where a stronger dose would entirely arrest the convalsion. A prelouged heat discharge has also been observed by so as the result of the convulsive scaure being accosted—a next of substitution of thermal for motor phenomena.

('Abredonials.—This is undoubselly a most valuable hypnotic, free from the unplement tasts of paraldehyd, and from the diagreeable taining of the breath entailed by the latter. It is fairly prompt in action, in this respect being superior to sulphonal (Gordse), but less se than chloral, initially in forty minutes to an hour. Very rarely are unpleasant after-effects experienced, and certainly no dignetice or gastro-intentinal demangement; nor is there any lowering of tody temperature. Culoralamide does not affect perspheral somitility; it diminishes reflex action, but does not depress rardiac, respiratory, or cerebral centres, nor is the blood pressure notably lowered (Gorden). As an analysis it is of little or no service.

This drug is of most service where olderal would be given were itnot contra-indicated by cardiac or vascular lesions, where valvalar or myocardial degeneration, or where renal disease with more or less vascular atheroma intersense; here this drug may be given safely, and often with the result of procuring a calm, deep, and refreshing sleep. In the incomnia of melancholia generally, we have found it was useful, but its value is also great in the wabefulness of alcoholic insanity and general paralysis. It has by some been also landed for all forms of acute manucal excitement. In senile insomnia its value is undoubted. Either sulpheral, trional, or coloralamide may be given in lies of paraldehyd or chloral, in cases where laryngeal pathiess or inflamenatory conditions of the throat or storagh preclude the use of the latter. It may best be given in similar does to chloral in an alcoholic attimulant in which it readily dissolves, but must never be combined with alkalies or in hot solutions, as it readily decomposes under these ambitions.

Parablelys. Prompt in action, even more so than obloral, this drug is a valuable hypnotic, producing in from five to twenty minutes. a calm, peaceful along, tometimes, however, preceded by alight excitament. Unpleasant effects, such as drownings, names, headache, rarely occur. It has been shown by Gordon' that even in minute doors at aids the peptone forming power of popsine, siways according the digestion of fibris, whilst this process is totably returned by chloralamide, sulphonal, and unethans: It, therefore, may be given with more confidence than the latter during the period of food digestion, It has been affirmed that the homoglobin is reduced by this drug, methemoglobin being produced; but this statement has been called in operation by Havers. Like sulphonal and urethane it diminishes peripheral sensibility; slows, but strengthens, the heart's action; and does not depress the respiratory centre. It is, therefore, far better adapted for cases of immaity complicated by organic diseases of the heart and vascular degeneration than chloral, which should be avoided here. It has, moreover, a powerful discretic effect and has no passanous action on the tissues.

For the insomnts of senile mania, either it or chloralamide may be given with great hope of success, and with no fear of disagreeable after

[&]quot; Hole Med Journ, July 18, 1891.

effects. Its analysis offset is so trifling that no reliance can be placed upon it unless combined, as it then may be, with morphia. In simple maniscal states it is a most valuable hypnotic, but not so useful as chloral either in the manis attending general paralysis or spilepsy; and, despite the statements of certain authorities, we have found it far seas useful in acute alcoholism than chloral hydrate. It can be administered at times advantageously per rectus. The great objection to this drug is its purgent taste and the exceedingly disagreeable and persistent ofour of the breath, retained often over twenty-four hours, and similarly occasioned when the drug is administered by rectum.

Dissiplement.—Among this group we have at least one most reliable hypostic. With respect to the individual merits of the three, sulphonal, trional, and tetronal, the latter has failed to realise the theoretical expectation that, having four ethyl groups to the molecule, its hypostic value would be far greater than the two former: despite the contrary view of Eumoni, clinical experience is generally adverse to this a priori diction. Tetronal, however, is a good sociative (Schapler, Continer), but is as little adapted as trional as an analysis, or in cases where the psychical and motor existement are very accord.

We do not hesitate to regard trional as far the after and best hypnotic of the group for cases of mental decangement; it is more readily decomposed in the system and more rapidly eliminated than sulphonal; hence its action is more rapid (twenty minutes to as hour) and effective, and its effects less prolonged; the sleep is deep, dreamless, and refreshing (six to eight hours or longer); not attended by the early irregular respiratory rhythm seen when sulphonal or chloral have been given, nor does it entail, like those, weariness, lassitude, confinion, and dreamy states. Lastly, cumulative action has not been observed, and only three or four cases are quoted (even these open to doubt) where homstoporphyrin has appeared in the sirine; nor has any evidence been forthcoming to prove that the drug exerts any ill effects on the heddly organs.

As a hypnotic we certainly have no safer remely than trional in most cases of siespleasness from melancholic depression, either with or without halluminations, in neurasthenia and in epileptic wakefulness. In general paralysis it is less useful than chloral; and in almosalic delirium it almost invariably fails (Koster, Kosmiger). We must always bear in mind the fact that where neuralgic and painful affections generally prevail trional is not the hypnotic to be given; or, if it be for any special reason shoren, it should be combined with morphia or some other analysms. Owing to the fact that its leneficial effect seems to extend to the next evening—a natural sleep being neurally obtained—some authorities (Kragii-Khing, &c.) recommend in to be given on alternate nights, or it may be varied, with benefit, by

other hypoteics, sulphousi, paraléchyd, chloral, se chloralamide; we regard this as an important feature in treatment.

As to its more continued use, the most important role is, we think, that advecated by Collatz* of giving small doses, say, 7 grains in combination with opium in simple melancholis; in this way most valuable sedative results have enaued. Impulsive forms of insanity are less benefited by it than by shloral or hypogramine, nor does it act satisfactorily in the excitement of general paralysis. One great feature is that no injurious action results in cases of earlies debility, or valually affection with falling compensation; here, where we does not give chloral with impunity, we administer sulphonal or trinsal with absolute confidence. West Mitchell has extended its role to epicpay; it appears to arrest the fits when brounds is for a time contraindicated, or when temporary dispension during beaming is called for. In like manner it has been found useful in the restlement of severe charm associated with insanity.

The maximum done of the drug should be considered to be 25 grains, but 15 grains is smally effectual; it should be administered in warm milk or other fluid, or in warm spirits; and, should the effect be unusually delayed, it may with advantage be given a short time before retiring to rest. It is also important to note that it is equally effectual when given per vectors.

Hysiopanise.—This powerful alkaloid, which is isomeric with hysiotise and atropine, has been found of fire greater service than the last in the treatment of instairty. It was investigated and extensively employed by the late Dr. Robert Lawson, and his every upon the physiological effects on the lower suimals and man still remains the usest reliable and classic contribution to the subject. He used it in the form of Merck's amorphous extract, given either by the mouth or subcutaneously. It, as well as hyoszine, has been employed very extensively since this date, both in England and on the Centinens, and our views as to its efficacy are now fairly clear.

In moderate doses there is a primary lowering of the pulse-rate, followed, subsequently, by a greatly increased rapidity which is long maintained; but if very small does be given, the depressive effect alone is witnessed and no stimulation occurs. If, on the other hand, large doses be administered, immediate atimulation of the heart's action takes place with no primary depression (Leuron). The physiological results of a moderate dose are—well-marked mydriasts in from three to five minutes, reaching its maximum in twenty minutes, and alowly subsiding, it may be, for several increasive days. The rise of the pulse-rate is associated with a lowered respiratory rhythm, and a

^{*} Revi. Kills. Work., Oct., 1993.

^{*} West Riding Auginta Medical Reports, wil. c., 1878.

fall in body temperature. The mouth and fauces become dry at an early stage, the secretions generally, with the exception of the renal, are diminished; as regards the latter, there is more or less discretis. Giddiness and drowniness are apt to prevail, and sleep is proze to be restless and disturbed. Mild excitement supervenes, attended with rather vivid ballucinations of right and heaving, and great motor impairment affects the limbs. Speech is somewhat thick and characterised by ramilling insoherence.

Hystoyamine has proved beneficial in reducing the excitement of simple and recurrent forms of massa, and also the maniscal excitement associated with epilepsy. It has been stated to have acted well in reducing the number of fits in the epileptic status; but in view of the undoubted efficacy of chloral here, it is scarcely admissible for this purpose, and our experience would be distinctly adverse to its employment. In chronic alcoholism it has been found useful, and in delusional insanity not of an acute type it has been much harded (Louves). Certain symptoms of insanity are well treated by this alkaloid, and the greatest benefit has accrued from its administration in cases of incessant garrulity or logorrhom, in the restlessness of senils mania, and in destructive tendencies, whether reluntary or incontrollable dissolvantage of the drug, which should always be borne in mind, is the tendency to came much dryness of mouth and throat, and to impair appetite when given in single large down; hence it is assertable where forcible feeding is necessary, or where loss of supetite and gastric disturbance prevail. It is, however, claimed for this alkaloid that continued use is not attended by these unsatisfactory results. Again, it should not be given where vascular disease is suspected, especially where extensive attactors exists. Two cases of hymatericals appeared to be very clearly traceable to its administration under these conditions. It must not be forgotten that its long-continued use involves errious less of body-weight.

So also in metanchalia, it is decidedly objectionable, and has always failed here in our hands. Whilst, therefore, its me is mustly restricted to maniscul conditions, it is for the milder and sub-aruse forms of mania that it is of object value; in very scute excitement it is contraindicated and a forcion in the form of aruse delirious mania. As a
hypactic its action is far more powerful than atropine, but the alkalaid
hymotics, which is stated to have five times the power of hyoseyamine
(Magnicoble), is more suitable for this purpose in doses of from the
to Jo of a grain. The advantage claimed for hyoseine is the freedom
from after effects, and especially the absence of constipation incurred
(Kimper and Seimburg). Hyoseyamine is of great value for its moral

^{*} Mrit. Med. Janes., vol. 11., 1888, p. 756.

[†] Dienimory of Psychological Maliene, Hack Take, vol. ii., p. 1142.

effect as an agent in the treatment of the oriminal type of insanity; this was long since maintained by Lawson, and our further experience of the drug certainly emphasizes this opinion. Whether this result entries from the moral effect wholly is open to question; certain it is that must impulsive forms of insanity of this class are benefited by hypecyamine, and the consciousness of the motor impotence induced may well play the chief factor towards the favourable issue.

Savage regards Merck's extractive as a useful form of restraint in violent and dangerous cases, "especially those that are very homicidal, and those that, seeming to have lost common semibility, dash themselves about and run serious risk of injuring themselves." *

Decoiror, and to be identical with hypocine, has been brought forward as a powerful sedative in conditions of maniscal excitement. Some authorities give the sulphate by injection in does as large as 1 to 2 milligrammes twice daily; but it is more prudent to limit the does to 1 milligramme = 001 gramme, to commence at 2 decimilligrammes = 0002, and marely exceed 0008 gramme. When large doses, such as 001 to 002 gramme, have been given, loss of appetite, comiting, and essaciation have ensued (Mangeri, &c.).

After subcutaneous injection of dubolsins, mydrissis rapidly enems, the pulse rate is lowered, motor sufeshioment corurs, and a profound sleep of neveral hours usually follows in suitable cases.

It has been given as a sedative in acute mania, chronic mania, acute alcoholism, and general puralysm with favourable results; but Mondel ameria that the drug acts by removing all restlemens, and not as a direct apporific, and hence, whilst it is useless in melancholis, paramola, &c., it is very valuable in accionnest with much motor resilements, unless the latter be due to hallucinations or delunions? Mendel administers it in dozes of from 5 to 8 decimilinguames. Dubowine has also been given with the best results in hystero-epilepsy by Albertoni and Belmondio, and also in paralysis agitum.

Our own experience is not in favour of its use as a substitute for hyoseine; the latter, or the hyoseyamine extract of Merck, is, in our opinion, of greater value and more extended application.

Opinion.—Our experience of the treatment of insurity by opinion and its several alkaloids demands from us the expression of unqualified approval. Granting that the cases be carefully selected, we know no drug in the pharmacoperis which is more directly valuable for the care of certain forms of depression. A fairly large experience has now indicated to us that opinion—and opinion alone—has any powerfully curative influence over such meiascholic reductions as are attended by notable seatlessness, mental disquiet, assistant fears, and depressing

^{* &}quot; Hyoneyamian and its Uses," Journ. Mental Sc., July, 1879, p. 183.

⁺ News. Central., February, 1893.

delutions. As a soporific, except where pain intervenes, we rarely or never employ opium; we have for more valued remedies at our disposal. Its rife, however, apart from its analgenic properties, is that of contingous administration in slowly increasing doses for the relief of painful mental depression, though not for the depression characterised solely by anergic and stuporous states. In these cases, then, of simple melancholia, with much motor restlemness, opium or morphia will not only relieve the depression, but will also often result in no disturbance of stomach or bowel; the appetite will often improve, and the bowels remain free from constipution. The opinion that if given for any length of time it invariably does harm by its effects on assimilation, as stated by Ringer and Sainsbury," is directly contradicted by the results of our experience in the treatment of depression, which, at all events, should be excepted from the verdict. Owing to its effects on the urinary secretion, many withhold its administration when albuminuria exists, and would strictly prohibit its use in confirmed renal diarnic. We, however, fully subscribe to the opinion of the last-named writers, that the dangers accraing from its use in these morbid conditions have been much overstated.

On the other hand, in cases of maniacal excitement we find opinion nearly always imadesiseible; it usually adds to the excitement, impairs the appetite, deranges perintalits; why its employment here is followed by such totally different results we know not, but, as a matter of clinical experience, such certainly appears to us an established fact.

In former days opium was given far more frequently as a suporific, but even then it was tought that where excitement provailed and evidence of "cerebral congestion" was forthcoming it was contraindicated. At the present time we should wholly discard opium for this purpose and fall back upon one or other of the more recent and reliable hypnoties. We prefer giving the drug in the form of the liquor opii sedativus, which is best telerated by its admixture with an equal amount of sulphuric other, commencing with doses of 10 to 15 minims twice daily, increasing the dose to 20, 25, and 20 minims three times daily, and escely, if ever, exceeding 40 minims for a dose, Bearing in mind the idiosyncraties of advanced age we may safely administer, in this manner, a maximum of 30 minims three times a day, or an equivalent of 12 grains of solid opture. The telerance established for this drug is remarkable in states of mental depression. and when, eventually, improvement in the symptoms supervenes, it is strange to note how little tembercy to habit is engendered and how well the subject stands the immediate withdrawal of the endomary andative. In fact, we can by no means reason from its operation in the same to its effects upon the insane mind. Should it tend to

[&]quot;Tuke"s Dier, Psychol, Med., rol, it., Art. "Sedations."

impairment of appetite, forced tengue, names, or constipation we may with advantage substitute morphia subcutaneously, but we shall obtain less of the stimulant affect of opium by this course. The hypodermic administration of morphia is useful when the patient refuses medicine by the mouth, and its prompt operation is one great advantage in its favour. We should not, of course, think of giving opium when there is marked decangement of the digestive organs ascens should be adopted for restoring the tone and functional efficiency of the digestive tract before commencing a course of opistes; the bepatic functions especially call for attention in this connection, and it may be necessary to wash out the stomach, to administer a mercurial purge, to give naphthaline, tone-naphthol, salicylate of hismath, or other intestinal disinfectant ere more special treatment be adopted. It may be laid down as a rule that in all cases where forcible feeding is required opium treatment should be postponed.

There are two affections where we should never attempt opinin or its alkaloids; we refer to scate delirious manta and to general paralysis. In the former, the adynamic symptoms are almost certain to be increased to an alarming extent if opiates he given; nor it even a single dose as a hypnotic to be given here at long as we have such reliable agents as chloral and the disniphones. In both the dismosteric and sentle forms of melanchelis, Savage speaks favourably of morphia in conjunction with other agencies."

Cosnetia Indica.-Indian bemp has had a very extensive trial in the treatment of insanity, and is undoubtedly a valuable scriptive, free from many of the objections attached to other remedies of this class. In full doses the drug causes great exhibaration and a condition of reverse with a train of mental and nervous phonomena of a most pleasurable nature; vivid hallocinations prevail, and the gay and pleasurable state may approach to a stage of ecitary. Wood given a lively description of his personal experiences after taking the drug. The above noted symptoms were followed by numbers, by "spells" of partial unconscioumen to his surroundings, time was prolonged indefinitely—seconds seemed hours, distance was exaggerated, and a horrible sense of impending death supervexed. Antagonism between his feelings and will was noted, passing into unatterable despair.) Many of those phenomena are experienced during the inhalation of nitrous exide gas; the prolongation of time, the exaggeration of sounds, the feeling of atter belplesmess and despair will be familiar to many who have experienced the effects of this gas. The antagonism referred to by Wood is in this case referred to an outside factor inimical to the personality rather than of the nature of dual consciousness. The drug-

^{*} formity and Attini Necourse, by Geo. H. Savage, p. 900:

⁺ Promis on Phonymatics, Art. "Canadia."

has a powerful directic effect, and this has been suggested as playing an important part in the avoidance of bromism when cannable and bromide salts are given in combination. The breathing and circulation are but slightly affected, and, although the symptoms of intoxication are so alarming to the patient, the administration of the drug can accreely be regarded as attended by any real danger (Wood).

A great disafrantage attacked to this remedy, as also to confust, is the great variation in strength of different specimens, and the consequent uncertainty of their action; name specimens are quite inert. Dr. Blandford found the extract vary immensely in efficiency.*

With respect to the therapoution of this drug we have found it of extreme value both as sedative and hypnotic in cases of maniscal excitement; but we have always administered it for this purpose in combination with bromide of paramiam (30 grains of the latter to I drawkin of the tineture). Its role seems chiefly to be that of reducing the excitement of chronic mania, more especially such cases as present hastile, vindictive, and homicidal violence; the drug appears in every sease a deterrent, without inducing impleasant and painful feelings, and where the latter exist as the outcome of personitory delusions a calmative influence is distinctly manifest. We are of opinion that the antagonism occurring in scote intoxication by the drog is mildly represented in the continuous administration of the analler doses in insanity, and that a feeling of timidity and distrust of their own powers is often ergendered and leads to a healthier and more rational adaptation in conduct. The class of pulicuts to which we now refer slerive benefit from a long course of the "green mixture" as we term the combination of bromide and homp; the appetite improves, the body weight is maintained, even if there be early loss, muscular none ic not impaired, at the same time excitement abutes, alsep is more uniform and complete, and the bodily functions are not disturbed. In other forms of excitement, such as the restlements of scalle insonnia, it is also advocated, and even for the electioneess of general paralysis (Dr. Essell Reprode). We cannot say that we have conferred this latter statement, but are quite convinced that its use, as De Reynolds states, in cases of acuts mania and alcoholic deliction is at least restricted, if not absolutely contra-indicated. On one point most authorities appear agreed; it is injurious in cases of melancholic depression, especially if given in continued doses.

In spileptic mania, cannable in combination with brouside is of the greatest value, and, in fact, in the whole list of the explosive neuroscathis combination is most suitable. It also finds its role in the excitament and visious turbulence of imberdity; still more so when the subject is an epileptic. It will be seen from what proceeded that, like

^{*} Inetally out to Treatment, 4th edit., p. 446.

hyoscyamine, we find cannabis most serviceable in chronic and incurable forms of inamity, and that to a certain extent it is interchangeable with the former in the treatment of these forms of disease.

It is well known that cannabis in the form of hashlash is the cause assigned for a large proportion of the invasity of the asylums in India and chewhere; thus at the Cairo Lumatic Asylum Dr. Sandwith found that out of a population of 226 males and 62 females, there were as many as 23 recent cases under treatment for hashlash, and 150 other chronic dements whose immitty was traced to the same cause.*

It is of interest also to note that Dr. Sandwith alludes to the ever increasing timidity of those accomponed to its continuous use, and which may partly explain the moral influence which this drug certainly exerts in antiprets of chronic mania.

Conium.—This drug was formerly used far more extensively than it is at present, and its disuse prohably is accounted for on the same grounds which led to its discontinuance by ourselves, vir., its extraordinary variability in physiological operation, and the absolute ancertainty of numerous samples of the drug worded. Frequently the preparations were quite inert, no trace of the usual physiological offsets being presented when large doses were administered.

This uncertainty of operation has proved fittal to its retention as a slepessur-motor for cases of insunity, in view of the far readier and more certain effect of other agents which may now be employed. Its physiological action is slowly established even under large doses; the pupils dilate, vision may be disturbed from paralysis of accommodation, some giddiness may be experienced, but the most marked symptom is great languer and muscular debility, arising from paralysis not of the tranks of the motor nerves so much as of the motor end-plates. The influence on the circulation is trivial, the pulse, at first depressed, becomes somewhat quickened. The sensory serves are not affected by medicinal doses; if bethal doses are given, tingling, nameboom, and formication have been complained of.

We have found this drug of value in simple mania, and in so other form of mental disturbance. When a trustworthy sample has been accured it certainly diminished the restless activity of the subject, had a powerful calmative influence over the excitement, and fostered the tendency to sleep. We have always administered this drug in the form of assess costs, and in doses of two to six drachms two or three times a day. The alkaloid has also been given subcutaneously and apparently with much increas by some. We have, personally, no experience of its administration in this form.

^{*} Journ. Montal Sc., vol. antice, p. 482.

PART III .- PATHOLOGICAL SECTION.

General Contents - Modeld Condition of Cranial Forces - Investing Membranes Frair Salatanov - Histological Elements of Cortex - Forms of Tissue Degradation - Pathological Anatomy of General Paralesis, of Epilopey, and of Chronic Alcoholism.

GENERAL PATHOLOGY AND MORBID ANATOMY.

Cententa - The Cramina - Dura Mater - Pia Anachund - Arachard Hismorrhape-Adhrent Pia - Vascular Apparatus - Cangestina - Tellamation - Softwarg Anophy - Miliary Sciences - Colloid Degeneration - Granular Disintegration of Nerve cells - Pigmentary or Funcous Degeneration - Developmental Arrest of Nerve cells - Vacualities of Cell protophum - Variotation of Nucleus - Postwation of Intra-certical Nerve tiles Pisans - Times Degradation from Over strain - Times Degradation from Active Method Processes - Times Degradation from Disease - General Summary.

The Cranium.—The bones of the skull-up present as their more frequent anomalies of texture, one or other of the following conditions:—(1) They may be thickened even to an excessive degree, and get be light in weight from the abundance of caretied diplos. (2) They may be increased in thickness, and heavy from general increase in density throughout, and subperiorteal addition of bone. (5) They may be extremely dears, but not thickness (on the contrary, they may be thinnes), and the surfaces chumated and polished in aspect. (4) They may be reduced in thickness and density, even to such a degree on to become semi-disphaneus over certain regions.

The first condition (due to subjacent irritation) is sometimes associated with thickened and adherent dura mater; subscute inflammatory states, probably, explain this association of central rarefaction with superficial hyperostosis. The second condition is far more frequent, and sometimes leads to extremely heavy skull-cape; it may also be due to prolonged and very chronic inflammation of the texture; although in many cases it is probably the result of repeated vascular engagements, and the excess of nutritive plasma brought to those parts by conditions of violent cerebral excitencest, occurring through a period of many years in chronic mania. The thickened dense skull-cap is frequent in epileptic subjects, and in the dementin

of chronic insanity." The inner serface may exhibit protuborant bosses, frequently coinciding with subjected atrophy of brain-orbitance; whilst the grooving of the vitreous table is converted into a deep channelling, extending almost to the cancellated structure, and bridged over here and there by newly-formed bony tissue. The hypercotosis is generally disposed over the whole of the vertex, but is almost invariably most pronounced in the frontal and the occipital regions, and more especially the former locality. When, as we occasionally find, localised hypertrophy occurs, the frontal bone is by much the more frequent site of the thickening. We have records of fifty-four cases of localized hypercutosis, and in thirty-one of them the frental was the site of this bony increase; in seven cases the occipital, and in six cases the parietal were the regions involved.

A not infrequent disposition, and one which carries with it considerable interest, is the thickened state of the left frontal amounted with that of the right occipital regions. The frequency of cranial hyperostoris may be glassed from the fact, that it presents itself in one-fourth up to one-third of all cases of insanity. Thus, of 1,563 fatal cases of insanity, the cranial bones were thickened in 404 instances (or 25% per cent.); and they were instanted, dense, and heavy in 523 subjects, or 33-4 per cent.

The diminution in the thickness and density of the cranial wall is most usually seen in senile atrophy; the process whereby such a condition is induced being, in fact, similar to that universally prevalling at this period. The facial bones, however, are more subject to this atrophic change than those of the granial cavity, and, in fact, we may note the co-existence of the former with hypertrophic thickening, and induration of the latter (Robitstely). The external lines are usually the site of most advanced atrophy, and irregular depressions or with alongside the nagistal suture indicate the absorption do- toexuberant Pacchionian boiles along this course. The vitreous table is more especially involved in these senile cates, and the morbid process is one of eccentric atrophy, the compact being gradually replaced by cancellous tissue. Detecubetes in the form of irregular superficial masses on the inner surface of the cranium, osseous spiculae, plates, and small exestores are seessionally met with; as also a form of elemented outcome of concentric lawelle with radiating canaliculi, and devoid of blood-vessels (Virolose, Cornil and Ramier). All those

^{* *} Hyperstania almost always presents itself in both its forms, namely, that of deposition externally upon the bone, and simultaneous condensation of its times inclesses. In a few cases it goes so to such an extent that the shull is not only (according to Indelect and Hg) larger than suctoral, missingers, and unconsecuty stick (9 lines to 1) or 2 inches), but it also acquires a weight that is almost incredible. "—Patiest, Asso., Rekitsensky, vol. in

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indicate "an extinct localised inflammatory process, the products of which here remain in an ossified form" (Grissiages). Our own observations tend (with certain qualifications) to confirm the opinion long since expressed by Dr. Bucknill, that the increased thickness of the cranium in insurity is not connected with cerebral atrophy, his statement being-"Some of the heaviest and thickest spania which we have met with have occurred in instances in which there was little or no cerebral strophy; and the condition of the cranious where there is undoubted strophy of the besin, is not unfrequently one of abnormal tenuity."*

Exostoses and bony spicular are exceptionally sare in those dying intane. Dr. Bucknill states that such outgrowths were found by him in but three cases out of 400 subjects. Our own observations would tend to render them of even less frequent occurrence; since out of a total of 2615 fatal cases of inamity exostones occurred in but six cases, and bony plates in the membranes in eight other cases.

Dura Mater. This tough inclusive sac investing the brain has so long been considered and described as of double constitution (that is, of dura mater proper, and parietal layer of stachnoid) that it becomes important to define our position respecting its nature ere we describe its anomalies. Rokitansky especially invists upon the distinction-"We are composted to adopt the distinction by the substantial difference which is exhibited, at least at first, by morbod processes in the two layers. Inflammation, for instance, attacks one of the layers independently of the other, and presents differences accordingly in its course, in its proneness to extend along the surface, and in the products it furnishes, which manifest the analogy between that layer and serous membrane in general," † Despite the assertion of so eminent an authority, the tendency of modern anatomists has been towards the contrary opinion. The epithelial layer, forming the inner amouth surface of the dura mater, is now generally regarded as proper to that membrane, and not, in the true sense of the word, a reflection of arachnoid. One fact, which tended to emphasize the divergence of opinion respecting this anatomical structure, was the frequency of the formation of so-called arachnoid cysts within the envity embraced between dura and visceral arachnoid. A certain number of pathologists regarded their origin as homorphagic, pure and simple: snother class viewed them as products of true inflammatory conditions; and the latter naturally held that the inner surface of dura, to which they are often attached, is a true seroes surface, giving rise to these inflammatory exadates. With Axel-Key, and Retzins, we would describe a risceral arachnoid only, so that the structures and

^{*} Populatopical Medicies, Bunkuill and Tuke, 3rd edit., p. 366.

^{) &}quot;Pathological Austony," Syd. Soc. Tress., vol. 44., p. 323.

spaces formed between the cranial bones and the brain would be from without inwards—(a) dura mater; (b) sub-dural space (formerly the "oraclmoid suc"); (c) anichnoid; (d) sub-anichnoid cavity; (e) pin mater; (f) epicerstoul space.

It must be remembered that this tough fibrous membrane is firmly attached to the inner surface of the cronism, as its inner periodents; but, the attachment amounts to firm adhesion along the autoral lines, and at the bunk openings, formen orale, formen become, and foramen magnine. It is supplied with bleed from the various memingeal branches, and a rich supply of nerves from the fifth, twelfth, and ayangathetic; in inflammatory conditions of the lone and of this membrane, the inclusive nature of the dura sets up very scate pain from compression of these nervous filaments (Duref).

Adhesion, to a morbid degree, betwist this membranes and the bones of the cranism is of frequent occurrence in chronic insanity; partial adhesions, indicative of bygone inflammatory change, are found in sittle 15 per cent, of those dying insane, whilst universal strong adhesions were established in 90 out of 1,565 fainl cases of mainly (a percentage of 5-7). The favourite site, as before stuted, for purtial ashesists is the frontal hope, either along the course of the coronal. satisfe, or in the hollow corresponding to the external prominences of the frental tours (10 per cent.); the next more frequent site is the sagittal line and the pursetal hone on either side. In a small proportion of cases, sixteen only (I per cent.), the chronic infammatory change had induced a noticeable thickening of the dura; and in a still smaller category was its appearance as to colour medified from the engargement of its small vessels (in such cases, the texture was softened and infiltrated, and the subjacent bone similarly involved). Morbid adhesion beswixt this membrane and the arachnoid and besinis of very sure occurrence; we have seen it in but 6 per rem, of our cases; and this we regard as another indication of the nature of the epithelial lining of the dura, which seems to present no morbid sympathy with the true arachnoid or to be liable to adhesive inflammatory states. Rokitansky has affirmed the frequency of such connections, but we fail to verify his statement; at all events, amongst the insane community.* The adhesions are often so extensive and firm that it is difficult to remove the brain without injuring the organ , hence, the skull cap with its attached dura have to be removed together. On attempting to separate it from the bones in these extreme forms, see fail to do so, as the membrane tears into sheeds or splits up into layers, leaving irregular white glistening membranous lamelie, strongly contrasted with the resy or deeper-tinted hope

See also on this point Dr. Buckmill: Psychological Medicine, Buckmill and Tuke,
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around. All this is, of course, indicative of the results of old-standing inflammation.

Bony plates within this membrane, as a result of further change in the inflammatory exudate, socurred in 8 cases out of a total of 2616. It is probable that the exestoses described on the inner surface of the bones of the skull have their origin often in the membrane itself, or in exudate intervening betwict the two. In one remarkable case the whole of the falx cerebri was thus ossified into a corresponding sinkleshaped bony plate,* such as permanently obtains in the ernithorhyachus; on the other hand, a bony tentorium corebelli, which we know is normal in many manusule, we have never seen amongst the insane.

The Pia Arachnoid. - A milky disudiness of the syschnoid is seen in most brains of those dying at middle age, and the opacity becomes more decided with advancing years, until, in the aged, it is seen to a natable degree, apart from any actual cerebral disease. It has been invariably attributed by pathologists to frequent congestive conditions (channis hypersenia) of the membrane, to which (as Rokitansky affirms) every one at an advanced age must have been occasionally ambject. Whatever be the explanation in the comparatively healthy brain, thereis so sould that in the extreme degrees of this change, seen in the intaire, we must infer a shronic inflammatory agency. In semile atmoby of the brain we see this physiological retrogression emphasised, opacities and thickening of texture being often marked features here, spart from any inflammatory change; the outbursts of senile mania are, however, often associated with a shronic meningo-cerebritis, which inductionally reveals itself in morbid adhesions betweet the brain and nost membranes.

It is peculiarly frequent in those prove to absholic intoxication (Bolitmaky, Grinninger), and we have seen it as a constant charge in the train of the same and insane criminal class—which class is, to a notorious extent, addicted to intemperature.) In the insune community generally, we have found americal opacity prevails to a notable degree—in marky 50 per cent. (772 out of 1,565 cases)—and, as much marked along the sold and the immediate vicinity of the blood-vensels.

^{*} A similar drawfure, overfitting as unique operiors of analogical cartety, a exhibited in the skull of a female belonging to my collection. (Observables).

^{*}For the histological changes of the parametrical, evoking the mally openly seen in insunity, cf. article by Dr. Robertson, Journ. Montel Sc., Oct., 1866.

^{2.} It may be generally considered as the possit of former chronic hypersonia and reflacementary states; it accordingly occurs together with increase of the Paulikonian generalations—which deposits on madegons processes easier all circumstances where habitual core-brail congestion existed during life, so in the case of drunkards, who, individ, can mostly be considered as mentally bealthy." Grinninger on "Mental Discusses," Syst. Soc., 1867, p. 418.

It is usually associated with considerable thickening of the pin arachnoid (the pin is abnormally thickened in fully 48 per cent. dying instance), partly from fibriness exedutes which have organised, partly from plantic lymph, and often from an orderators avoilen condition of the conjoined soft membranes, and the trabecule intervening betwise them in the sules, resulting in a watery, semi-translacent, gelatinous appearance, with here and there scattered patches, points, or streaks of opacity. The outer surface of the arachnoid, covered with a delicate pavement-epithelium, becomes at times perceptibly rough and granular, both to the touch and to naked-eye examination; the condition resembling, histologically, the granular condition of the spendyms, or liming-membrane of the ventricles; it is especially prone to occur at both sites in general paralysis of the insens."

The conditions above referred to of opacity with thickening of the pia arachnoid unit be mattended with any excess of fluid in the sub-arachnoid space; munilly, however, in the chronic insune, great excess prevails, so that the normal limpid cerebro-spinal fluid (which varies considerably between 2 drachms and 2 outcos) may be very largely anguented up to 8 or 10 ounces; the soft membranes are buayed-up by such accumulation, and their meshes become thickened, glutineous, and water-legged. The fluid is acid in reaction, whilst the normal cerebro-spinal fluid is alkaline. It must be borne in mind that this sub-arachnoid certity is continuous with the general ventricular cavities of the hemisphere, with the central causal of the spinal cerel, and with the sub-arachnoid space; products of inflammatory activity being thus capable of transmission to distant parts by the movements produced in this fluid during becamotion, respiration, and circulation, all of which are known to affect the cerebrum.

In connection with the aracinoid there is an important mertial state, the frequency of which, in instanty, and especially certain obvosic forms of instanty, makes it a striking feature in our past mortes records; the condition referred to is that of false membranous productions, enclosing various contents from straw-objected serum to thin bloody serum, or blood partly or completely clotted. These formations have been after referred to by the impt term of arachment costs. When they occur as gelations looking exudates or pseudo-membranous structures upon the inner surface of the dura, they have been regarded as inflammatory in origin, and have been described by Virchow as pachymeningitis interna, in accordance with the view of Calmeil, Boyle, and others. We incline strongly to the view that the inflammatory theory of their origin cannot be supported by a title of evidence from asylum experience; there can, we think, be little or no doubt

^{*}Sec "Dependence Lemon of the Arterial System," by Coull P. Beadler, Journ. Montal St., Jun., 1880, p. 45.

that, in the case of those dying insure at least, we must claim a hæmorrhagic origin for such formations." Their frequency may be judged of from the fact that 81 cases are recorded in 1,565 autopoics of the insane, and their special frequency in that form of insanity which is associated with general paralysis, is emphasised by the occurrence of 30 instances in a series of 242 general paralytics (a percentage of 12). The appearances presented by them vary considerably with the stage at which they are famed. In early stages we may find a slight rustystaining over a more or less localised patch of the inner surface of the dors, or, perhaps, covering the whole area of one of the force (and especially the middle fosts at the base of the skull); over this rustystained groundwork minute decodets of thool are seen, as if hesprinkled by a brank, or as if the blood had oneed from the surface by a nort of awesting process. The rusty-staining can be airaped off as an extremely delicate and structureless pellicle. Or, again, the inner surface of the dura may averagreed a somewhat amber-coloured glutinous-looking layer, which can be readily stripped off and appears to be a purely thrinois formation, enclosing more or less arterial blood. Such structures form translucent pelifeies, which, when examined, look like gotta-percha timne stretched to a delicate tennity. The extravasation is often extensive, flattening the convolutions, and inducing considerable strophy-a simple dark clot of blood moubled to the form of the amehneid eavity occupied by it, thick at its central parts, thinning out towards its margin, and covered with a delicate fibrinous layer above and below; or the fibrinous formation may be thicker, more organised, and may constitute a complete sac enclosing the blood-clot. Rokitansky's classical description holds good for the formations in the insinc.

"Its allowing with the dark mater, too, is loose it partly clicks on, and partly is connected with the membrane by a few small resochs. Both walls of the arc are smally at a brown, easily relocue, and teractions. They may after to separated into several layers which vary in thickness, but the inner of which are more thin; at the rangin of the sac they coalesse and form one limits, which now become reduced to a thin, brown, rusty-coloured membrane, and spreading our further on the crastid vanit, reaches to the base, and at length terminates in a thin, rusty-coloured, game-life film ... within, the was contains a minute of less thick field, if a dark and emison robors, like chocalitie, or plans—ance, rust, or yeast; in source of time the lymph is gradually removed, the more sertice of the air becomes smooth and polished, and the contents are changed into a colourless, this, clear, secure fluid." †

We have never observed what the same authority states is of occasional occurrence—vir., the ossification or formation of hony plates

[&]quot;See "The Pathology of Saladonid Membranes," by Ford Robertson, Joseph Meson So., vol. iv., July, 1896.

t-Opt. cir., p. 330.

or concretions on its outer wall next the dura. Some of the more cogeni reasons for regarding these formations as non-inflammatory are:—

- I. The eyet is readily removable, slightly (or not at all) adherent to the dara mates.
- In the unjurity of cases there is no evidence whatever of the existence of a parhymeningitie; (a) the dura is not thickened or softened, or vanualar; (5) no organic connection exists betwire the two.
- 3. In early stages the characters are purely those of a simple extravasation of blood into the arachnoid cavity (subdural space).
- 4. There is the co-existence in this affection of a recognised vascular disease and vasconotor disturbances which render hamorrhage frequent—e.g., the ethematoms or "insure ear."

In an important communication my former colleague, Dr. Robert Lawson, supressed the same views as are been entertained.*

As regards their cause and origin and general etiological relationship amongst the insane, it has been pointed out by Sir J. Crichton-Browne that the age of their more frequent occurrence was between 35 and 45 years—an important feature as distinctive between it and ordinary forms of cerebral lemnorrhage, which occurs more frequently at a much later period of life. The same authority in an analysis of fitty-nine cases of arachmoid cyst, occurring at the West Riding Asylum, has clearly sutablished the wast prependerance of this accident in cases of general paralysis, as seen in the following table:—

REPTY-OTHER CARDS OF ARMORPHOUS CERTS.

General paralysis offering		-			29,
Chronis disorganisation of brain-		1.61			- 18
Soulle strephy	-			400	- 4
Epilepsy				-	13
Marin associated with shores	4	-			- 2
Mania with meningitie		100	- 1	100	- 6
femalty with Bright's disease		11		11	2
Chronic rames with philips			-	.0.	1.0
					700
					-590

As regards sex, it is recognised as occurring more frequently in mon, from very abvious reasons; the most important being the greater

*The Lawren's statement is to the following effect:—"Amongst the same, amongst drumbards, and in cases where injury has induced packymorangitis external, then production of arachaetid cycle by the replace of vessels formed in inflammatory products might readily occur. . . . It is evident that at least the large majority of coors of horistons in the limites, originals in direct suprare of vessels and extraorastion into the arachaetid and (1904, and Formed, Chie. Review, 1976.)

frequency of its congener, general paralysis, in the male than in the female.

Our records embrace the histories of 73 additional cases since the above were tabulated by Crichton-Browne, and these, arranged as to associated cerebral states and sex, illustrate forcibly the foregoing statements:—

SENTETT-DIRECT CASES OF GRACIDOOD COST.

Report parsiyan afterful intenses	in	30	Males	103 1	Penulm
Chemic disregarisation of the feats	-	12	-11	- 1	
Serile atrophy		15		- 5	
Nyllepsy -	-	3.		-0	**
Manta .		-11	10	- 1	
Melancholm	_	-1	44	- 9	1 10
Hing	9	-	-11		- 11
		35		15	

On summarising both series we have 132 instances of arachmoid cyst; 63, or 47-7 per cent., occur in general paralysis; 35, or 26-5 per cent., in chronic disorganisation of the brain; 12, or 9 per cent., in sendle strophy; 7, or 5-3 per cent., in spolepsy; and 15, or 11-3 per cent., in several other forms of mental nilment.

The site of hamorrhage is almost exclusively confined to the vertex and lateral supects of the corebrum; we have never seen it on the lower supect of the tentorium as within the cesebellar fosse of the armium; it is also of rare occurrence in the anterior and middle fosse at the base.

The 6,0 hemisphere is more frequently the site of the hemorrhage than the right, as indicated in the sixty-five more recent cases extracted free our records.

WIR OF ABBURERS RESIDERANCE IN HUTT-TITLE COM-

Both lemispheres generally	-				- 5		in
Left hernisphrop		-					20
Right teampiere is		_	30	4	- 1	-	111
Hight purieto occipital regi	-	4	-	7.1		-	2
Bight frontal popier		-			-	-	- 1
America from at base	2	- 20	2	-	+	-	- 1
Asterior and reddle form							2

The extravaration most probably occurs from a vessel of the pia mater, the vessels of which in general paralysis show very special lesions forming one of the most constant changes in this affection. The discussed condition of their tunics, which we shall allode to later on, is greatly aggravated by the repeated, violent, and long-continued outbursts of excitement to which such cases are subject; and the ressels which have undergone most change are decidedly those in the anterior regions of the brain, coinciding with the more frequent site of these arachnoid hashorrhages. The arteries coursing within the sulci are, of course, better protected by the support they receive, than the veins distributed over the exposed surface of the gyrt; at the summits of the gyrt there is evidence of inflammatory activity, well marked in the presence of meningeal adhesions. The vascular notwork supported by the pin at these sites is most affected by the morbid changes taking place, and hence, the venules are kept in a state of continuous engargement near the site where they empty into the larger veins running to the sinuses, a condition further aggravated by the active arterial flow of functional excitement. Thus, in our opinion, the occurrence of at least a large proportion of these formations is explained as due to:—

(a) The initial diseased condition of the vascular tunion,

(8) The distended condition of the versus system from atrophy, and consequent loss of support, and obstructive conditions due to inflammatory change.

(c) The anatomical arrangement of the veins, involving them in the most pronounced inflammatory change.

We have allused to the evidence of congestive and chronic inflammatery conditions presented in the notable opacity, with thickening of the soft membranes, the presence of efficied lymph, and, we might add, the somewhat rare condition of purulent infiltration of the membranes at the vertex in certain forms of insanity. To these we must add, as indubitable evidence of inflammature activity in the cortex and its investing membranes (chronic manings-cerebritis), the frequency of morbid adhesions between these structures. Such morbid adhesions occur in chronic immity, in chemis mania, in sende mania, occasionally in alcoholic immaity, and especially in the mental derangement associated with transactions. It is, however, in general paralysis of the insure that this condition forms so important a feature as to constitute the one distinctive sign indicative of this disease to the pathologist. In a small percentage of cases only is this important sign absent; but in such exceptional forms other indications are sufficiently expressive of the nature of the diseased process. We shall describe in detail the morbid process as it occurs when dealing with the special pathology of general paralysis. For the present we have to deal with the general features possented by such adhesions in this and other forms of mental disease. I find from Dr. Bullen's statistical compilation from our West Riding Asylum Records, that out of 1,365 fatal cases of insunity, morbid adhesions betweet besin-cortex and incouring membranes had been contracted in 340 (instances, or 21-7 per cent. of the whole; whereas in a former study of general puralysis, some years back, we found that in 241 cases of this disease which had proved

fatal, 185 (or over 17th per cent.) presented well-marked adhesious, the remaining fifty-five (or 22-8 per cent.) being described as free from such implication. We must, however, be prepared to meet with mass where it may be dublous bow far we should regard the connection as amounting to a morbid adhesion; but in our statistical results above recorded, we include only such instances where the removal of the membranes necessitates a ferring mean of the superficial cortex. Undoubtedly, many other men of morbid firmness of union present themselves, which, therefore, escape from this category; and this was the case in many of the 22% per cent, in which genuine adhesions were excluded. The brain of the alcoholic presents instances of this morbid firmness of union; and, histologically, this is attested to in the presence of the same mortal elements which are found so professly scattered through the cortex in genuine cases of adhesion; but we do get find in the alcoholic's brain, as a rule, anything more then this undue firmness of union.

On attempting to stray of a portion of adherent membrane, there are seen by the naked eve namerous tough fibrous prolongations, which look like enlarged blood-ressels, connecting the under surface of the pin with the cortex of the brain. When forcibly removed, the upper layers peel away to varying depths upon the pin, leaving an erobed surface which presents a highly characteristic aspect. The surface looks grawed to worst exten along the length of the grai with irregular mmuo a margina, so that it somewhat resembles the aspect pecsented by a succelent leaf which has been attacked by a caterpillar. The base of the erodod (or rather, torn) surface is distinctly punctated by large open prifices from which course vessels have been withdrawn. Adhesions of source age exhibit a marge dense thrillar connection betwire pin and cortex; the mentally delicate retifers aspect of the negroglia is lost in the coarse übrelistion which has ensued. In earlier, stages the appearance is suggestive of inflammatory implication, in the distinctly-pinkish appearance of the cortex, senetimes diffused, sometimes limited to the areas of recent adhesions; the pix is thickened and tunnel, the seat of nuclear proliferation, its vessels doubly engarged and the superjacent arachneid also thickened, opaque, and ordeniators. The distended vessels are course and tortuous, their sheaths thickened by multiplication of their cells and the traversing of their atmotore by wantering lencocytes. The microscope reveals infiltration of the cortex. by large numbers of peculiar spider-like colle-oval, flash-shaped or glabous but all throwing off numerous delicate throwing percesses which eatwise upon the vascular walls and meander amongst the perseelements of the cortex. Such spider-like cells are found in my recent ashesions in the upper layers of the cortex, immediately beneath the afferent pia, forming a direct connection with its under surface and the vessels passing from it into the substance of the brain. Around the walls of the blood-ressels these elements tend especially to crowd, and their ramifying extensions will, probably, by subsequent contraction, sectously interfers with the personbility of these channels of uniriest supply. The pressurest ride assumed by these regardance in general paralysis of the immue, the frequency with which they are seen, and their very striking features, induced certain observers to regard them us pathognomonic of this disease. We had, however, some years previously indicated and sketched their appearance in sentile atrophy of the brain (Pl. axiii., §y. 1), and had recognised their existence in other meetid conditions; " in fact, they represent a hypertrophied state of what in our section of the normal histology of the cortex we have described as its "lymph-coansetive" system.

The reason why these morbid conditions are not more frequently seen in sendle atrophy and other pathological states of the brain is that the stage in which they are fersted is an early stage of the disease, a stage which in most fatal cases has long since passed by ; the organisms have accounted to a fatty liquefaction and so been removed from observation. General paralysis, however, is a comparatively rapid process of dissolution, and intercurrent affections often prove fatal, and afford us illustrations of its morbid anatomy in early stages; hence these morbid appearances are frequently met with, yet not constantly, for, at an advanced stage of this affection also, the morbid cells degenerate and disappear, leaving their fibrous meshworks as their sole representative. In shronic alcoholism, again, such products of morbid activity present. themselves, frequently in great abundance, but never, in our experience, to the extreme degrees met with in certain cases of sendle atrophy and general paralysis. ! In Sect, it is our opinion, based upon a large number of observations, that where a specially irritative process is engendered in the certex, and more especially where a large accumulation of dependentive unterial has to be carried off from this region, or where effete material accumulates as the result of some obstruction to the nernal transit of lymph from the brain, there we are likely to meet with these rast developments of "spider-cells," as they have been temped. Hence in a chronic meningo-cerebritis, attended by much effusion into the ensular sheath, by extravasations into the brainexhetance, sail by the raried products of inflammalory engorgement of the part, this "lymph-connective system" of the preroglia (as we have

^{*} Proc. Sep. Sec., No. 182, 1977.

[#] See in this connection "The Meried Changes of the Aged Innane." by Alfred W. Campbell, M.D., Journ, Newton Sc., Oct., 1888, p. 645, in which an attempt is made to distinguish the typical scale spides cell from that of general paralysis and of alcoholic transity.

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ventured to term it) undergoes the functional hypertrophy here alluded to, in an extreme degree,

Again, in the later stages of senile degeneration, the fatty atrophy of texture has advanced to so extreme a degree, usually during a very prolonged course of many years, that the surface of the cortex is widely severed from the sembrance coupling it by the compensatory accumulation of fleid; any delicate adhesions which had been formed in early stages have been suftened and broken down. The membranes are not thickened to the same extent as in general paralysis, where they often form a dense, thick, felt-like structure which fully occupies the space forced by the recession of the atrophic beain. The physical emditions, therefore, as well as the more rapid course of the one compared with the other, have probably much to do with the presence or absence of adherent membranes. We must, however, not omit the fact, that the tearing of the cortex is, to a cortain extent, also due to the softming of the outer layers of the cortex by the informastory. precour; but this alone by no means accounts for the appearances, since the condition observed on removing the membranes in a brain simply softened by decomposition, or from those regions always excessively soft, at the basal aspect of the cerebrum, in ne way reproduces the appearance of the croded cortex in general paralysis.

The brain-substance, both grey and white, in fatal cases of insanity is found in a very variable condition of vascularity dependent frequently upon wholls extrinsic agencies and accidental states, which are completely foreign to the cerebral disturbance existing during life. We must remember the peculiarities of the vascular mechanism we are dealing with, which explain to a great extent the variations noticed. The pia mater is a wandrously vascular meshwork, capable of an entremous degree of distention and venous engargement, as we sometimes see to an autonialing extent in obstructions to the return of venous blood to the heart, in cases of intra-thoracic pressure. It seeves the purpose of bringing into immediate contact with the surface of the brain a very large amount of venous blood; the carriers of which are se disposed as to offer a direct mechanical disadvantage to the return of venezu blood from the cranial cavity-the current of blood in the large recebral weins being opposed to that of the current in the sinuses by their oblique direction and opening into the sinises from behind forwards. Thus, whilst in the vains of the lower extremities, special facilities (such as their valves) are introduced to favour the circulation in its return, the intracranial veins have a direct obstruction offered to the too spoody flow towards the heart; so obstruction which even leads to a hypertrophic state of the tissues in this immediate neigh-

bourhood.* The venous blood in this vascular membrane and system of sinuses serves the purpose of keeping up a sustained backward pressure upon the cortical venules, and thus effectually provides for the continued patency of the minute vessels of the cortex. It is only exceptionally that this patency is interfered with to a state of complete anomia, when, of course, unconsciousness supervenes. Sloep is an matance of a rhythmic interference with this condition; and the agency whereby the amornia is produced in well illustrated in Mosso's experiments with the piothyrmograph, whereby he clearly shows a wellmarked dilatation of the peripheral vessels as the immediate prelude to sleep. A similar condition of things is found at the other extremity of the cerebral acculation was, the basiler artery. Here we find the two vertebrals taken sagesher about double the capacity of the recipient. basilar artery; and as the result of this a sustained pressure of no inconsiderable degree is kept up in the minute natricut arteries passing direct from it into the substance of the poes. Hence these vitallyimportant centres are kept continuously aspplied with blood, a supply which will only be augmented as contraction in the distril combent branches produces anemia in those parts. If we keep this mechanism of the vensus system of the cortex in view, we at once we how variable will be the vascular appearances of the brain according to the mode of death; the presence of obstruction in the heart and lungs tothe renous circulation, and especially obstruction in the cranial aircuses, such as frequently occurs in cases of insunity. So libewise the mode of spening the body for post-sorten examination greatly modifies the appearance of the cortex and white matter, but especially of the soft membranes. If the cranium to opened before the thorax, the vessels will be found for more engarged than when the reverse procedure is adopted, whereby opportunity is afforded for draining off the blood from the head through the large veneds so severed in the chest. As to the results of intra-thoracic pressure, we must be prepared to and engargement of the cerebral vasuels in the par in all cases of severe obstruction or obliteration of the pulmonary blood-rensels-e.g., extensive new growths in the mediastinum, copious plearitic offusious, constriction from various causes of the roots of the lungs, Shroid

[&]quot;The common thickening of the membraness over the upper surface of the beam, successing cowards the longitudinal sixus, is explicable by the mechanical competion that must be favoured them, through the current of blood from the combant competion that must be favoured them, through the current of blood from the membral come extend to the steam within the time. The clock as caused to the entering stream will have most effect on the part of the stream that is sear the coin wall, for this is weaker than the current in the middle of the coin, but this parietal layer of the stream receives the blood from the parts near the sixus, and hence those will bed the clock more than the distant parts, and will tend to be bold all one's life in a state of mechanical congestion of mild degree " (Lectures on Assignical Pathology. Manny).

induration of lung, &c. Rokitansky has alluded to the extremes we occasionally meet with of this obstructive engregement of the cerebral membranes, the reusels of which he describes as forming "spirally. twisted coils and intestine-like circonvolutions". Nor is this say exaggeration of what we see occasionally in asylum practice. should have said very ravely, for but three such cases have occurred in our experience of counterably over no ricosomé inspections. Such, for instance, was the case of an alcoholic subject suffering from fibroid induration of the lung, and in whose case capillary broachitis supervened, resulting in an extressely-sturoness condition for days together. The necrosary revealed an extraordinary development of various and contorted vessels in the membranes, actually concealing from view extensive areas of the brain-enrine; whilst enormous numbers of extravasations varying from military and punctiform homogrhages to patches from a pea to a forin in extent were scattered throughout a deeplycongested brain both in grey and white substance. † To a much less marked degree is the suggreement recognised in obstructive thromhosis of the simmes, for in all examples met with we have found the patency of the channel diminished only to a minor extent from firm organisation and shrinking of the clot. Death from pelmonary gangrene occasionally occurs as the result of such clots, or portions of such dialodged, passing by the right cavities of the heart into the pulmonary vessels. The result of contraction of a limited vascular area of the cortex upon neighbouring territories must, we opine for the present, he a most point; but we manut fail to segard it as highly probable that any such limited sparss must tell in an exactly reversed vascular state of neighbouring cortical and subcortical tracts. The certical natrient branches form, as we have learnt from M. Durst, an absolutely cerminal (non-anastanotic) system of vessels, and (counter to the riew of Heubner) the larger branches of the pia also uspout individualised and but feelly inter-communicating territeries. Hence, we have reason to infer that each terminal system is the representative of a neuro-vascular autonomy; and that limited spasses of such a system, whilst raining the blood-pressure generally throughout the periphery, also came incremed flow to neighbouring cortical renfus. How extremely delicate is the adjustment so affected is obvious from the researches of Mosso, who remarked that in the case of his patient, when selecy, the slightest sound, such as the tick of a watch, or a spoken word, short of awakening the sleeper, invariably caused increased samularity of the brain, with a corresponding fall of blood pressure in the arm, as registered by the plothysmograph,

^{* &}quot; Parihological Amerony," Systembour Sher, soft iv., pp. 372-3.

⁺ See also a similar case reported in the Louise for January 11, 2875, by Dr. Complaint.

Such an observation gives us a graphic illustration of what is continually occurring during the normal active processes in our conscious mements, as the more result of sensory excitations alone.

A bright red blush irregularly distributed in patches is often observed in the cortex of those dring insune, a rosy-tinted mostling, stipuled here and there with the orifices of larger vessels cut scross, and defining (in most cases very accurately) the limits of certain independent variable tracts or plexuess. It is more frequently an accompanioned of the score acute forms of insanity, and we besitate to attach to it use forther benertance than as indicating the severity of the late functional disturbance. Certain it is that this appearance is not necessarily overelated with any obvious structural change in the meet; nevertheless, it is a witness to the storm which has swent mut. We have suggested elsewhered that, "the last not of arterial contraction, in which the smaller arterioles have failed to empty themselves into the venous system, may in part explain this appearance," and have also noted how "this blotchy red aspect of the cortex reappears very frequently in the medulis in similar cases;" and we still regard it as probably so explained, the follure to contract being evidence of the paretic state of the vessel, whilst the effect of limited spasors would from our former remarks be still more likely to insue in this blotchy. mutiling of the cortex. The same remarks apply to the rosy vascular gones which so frequently present theanelyes along the junction of the white and grey matter. This and the fourth laser are usually the nises of the rose discoloration now alluded to; and this coincides with the results of imperfect injections of the cortex, which indicate that the long straight vessels and their horizontal nexus on the confines of the grey are the most readily filled; next, the plexus around the cells of the fourth and fifth layers; and lastly, the vascular plexus in the third and the first layers respectively. We have attuded to this ready tilling of these straight vessels of the medalls as a sort of safety-valve action for relieving the cortex from undus engargement. The rosy mottling of the modulla is sgain a frequent accompaniment of the foregoing signs where such percheal excitement has preceded death, or where epilepsy has terminated fatally in the "status;" and in such cases it is interesting to note the comparative pagetty of nuncta vasculosa which undoubtedly (as Niemeyer has stated) form a most unasfe criterion to accept of congested states of the brain ! Since, then, the appearances above detailed are occasionally the sequence of other than morbid states, how are we to deal with their significance as morbid signal. The reply is, in the presence of minute extraordistics, in the convenies or evident disease of the small

^{*} The Hanna Brain: Methods of Evansionation, p. 53.

[†] Text-book of Molicine, Niemeyer,

resents, in the existence of much ordens of the times, in the altered consistence and specific generity of the times; all of which affect indications of value are we resort to more minute histological examination.

Increased vascularity is by no means the more frequent appearance found in fatal cases of imanity-in acutely-armiacol conditions, and especially in general paralysis, it is often claserved; but, by far the larger number of cases afford evidence of poverty of blood in the brain and general malnutrition. Thus uniform pallor prevailed as a noteworthy feature in 841 cases out of a total of 1765 autopaies, or considerably over one-half (53-7 per cent.). What was stated respecting the independence of valcular regions of the brain as regards both the terminal arterioles and the larger areas support off by the distribution of three main arteries of the cerebrum, is illustrated by the assembly states of the cortex, even as we found it was by states of hypersonia. We find conditions of patchy paller meetling the corner, or a uniformly diffused pallor, or, not by any means infrequent in cases of seclasefulia, a notable paller of the carotid areas associated with fulness of vessels. both of the white and grey substance in the vertebral system (posterior cerebral). By far the more extreme forms of america met with in the irrane are cases of abronic pathials, unfortunately so frequent in asylums. The pallor is a most striking feature, and is due, of course, to general bloodlessams throughout the system. So also as the result of severe homorrhage, as in the post-purious homorrhage which may other in presperal manuty, this condition of blanching will be found present. Intracranial pressure, again, such as results from emginieous apoplexy, the presence of adventitious growths, or exemire development of intenstitial connective (nearogile) may all lend to notable amenia by freethly exclusion of blood from the corebrait vessels; but, here the blanched aspect of the surface is associated with so much flamening of the convolutions that the conditions are at once appreciated.

Inflammation.—Acute terebritis as a diffuse affection of the brain we have had no experience of assenget the image; on the other hand, as a localised condition due to focal lenon, at is by no means ancounted, whilst a chronic meningo-cerebritis is also of very frequent terms of the condition of the process first, we usually find it as the result of an embolon or thrombus of a cerebral blood-west, which has given rise to much punctifiers hemorrhage around, or to hemorrhage fool in the cortex or gaugin; or, again, to the presence of new growths, such as carcinous or tubercle, which are frequently surrounded by a zone of red inflammatory softening, beyond which extends a further non-inflammatory zone of simple white or yellow softening. The corebral tissue so involved is awoilen, distinctly estemators, and

variable in its consistence up to the extreme degree of diffuence; it is usually of bright pink hue, with strenky or punctated hemorrhages acuttored throughout its texture.

The inflamed tissue may show little or no discoloration, in fact this is very frequently the sase; but in all instances we find the presence of infamoustory exists a modifying the appearance and textural continuity of the part, presenting compound granulo cells, nuclei, leucocytes, broken-lows nerve structures and pigment; whilst the specific gravity will be invariably augmented by the infaminitory exulation present. In the immediate neighbourhood of such inflammatory patches we often find the tissue in a state of white or yellow softening, non-inflammatory in character; in fact, due to interference with the natriout appole of the part, to plugging of the minute vessels, or to direct pressure of the swellen adenatous tissue around the inflamed focus. There is no causal connection betwist such states of inflammatory softening and insanity; they occur as accidents in the course of certain vascular diseases associated with mental disease, and, therefore, it is necessary. to allude to them here. For otherwise is it with the chronic inflammation of brain and membranes which is intimately related to the insidious and fidal maistly, general paralysis. In this form of chronic meningocerebritis the inflammatory changes togin, probably, at several different points, specialing from one convolution to another, until in many cases the whole cerebral mantle is involved, with the exception of the occipital gyri, which almost invariably escope implication. progress of inflammatory activity is mently most nurked in the frontal regions in both hemispheres, and less advanced in the parietal. The cortex is seach thinned in the fronto-parietal region, and of very variable colour, frequently exhibiting the irregular mottled aspect from pinkish discolarations or congested patches, but also quite as otien pale grey, or of a uniform dirty grey has with but poorly-defined lumination. The arterioles of the cortex are frequently and notably course and engorged. The substance of the cortex is much reduced in consistence, and edemators; the whole brain is softened, and has an ill-nourished look; in fact, apart from the firm inflammatory adhesion of the opaque and thickened membranes, the naked-eye appearsnees of the cortex are not unlike an extremely ill-neurished and atrophied brain in old age, presenting in itself no characteristic indications of the extensive inflammatory changes which it has undergene.

Softening.—Out of 853 cases of insanity proving fatal, 320 afforded instances of an increased consistence of brain or one of average frames: the remainder were noted as having a diminished consistence throughout. The actual figures were as follows:—

Increased communes throughous	et .			98 98	MEN.
Firm consistence		- 6	*	110	-
Fair or average consistence	- 1			152 .	
Diminished consistence 14	4		- 1	483	

Roughly speaking, therefore, close upon souhalf (or 45:7 per cent.) were of normal consistence or above the usual degree of firmness—the remaining 54 2 per cent, being actioned, either as the result of disease or of post-mortes change. As a fact, however, a state of general reduced consistence, apart from any putrefactive process, prevails in a large percentage of cases; and this is accounted for by the large proportion of cases of sends atrophy, of general paralysis, and of organic brain-disease (the result of diseased arteries) which accumulate in our asylums and feres so large a fraction of the fatal races. The present diminution in cerebral consistence may be due to orders of its texture, as the grey matter has notatio hygrometric powers; it may be due to disintegration of structure from the fatty degeneration of senility, or from extensive vascular disease restricting its natrient supply, or it may be the result of inflammatory processes. In all cases we observe that the vascular system is targely involved. The orderns is first established by the undue engagement of vessels which thus relieve themselves (not only in congestive and inflammatory processes, but also in the atrophy resulting in the so-called Androps or succes; the fatty disintegration of senile besin is invariably associated with, and greatly furthered by, discused arterial tanics; and, laxly, the inflammatory processes, which are of a chronic diffuse nature, are, we believe, in themselves vascular in their origin. Hence we see how large a section of the ineans show indications of defective natrition in the central nervous system, and derangements of its blood supply; yet scate or recent insunity affords few and far less pronounced signs of such impairment. It is in the chronic stage of insanity that obvious structural changes indicate to us the serious nature of the nutritive failure. In instances of general reduction in the consistence of the brule, the organ fails on removal to maintain its erect position; it falls apart at the commissural junctions, the diverging hemispheres tending by the more effect of gravity to four the latter number, especially us these commisseres are themselves unduly soft. The hemispheres have lost their plump contour; the correlations may have undergone considerable strophy, and their widely-gaping suici may enclose much serous fluid; whilet the whole brain feels flabby to the touch, and devoid of its normal compact aspect, as well as of the first and resilient feel of healthy structure. In the rentricles we often find considerable scrops fuld undaly distending these cavities, whose walls have a macerated aspect, and are undergoing rapid solutions of continuity. The white substance may have a glairy, brilliant aspect, be much softened in

texture, pit on pressure, whilst few or no puncts vasculess appear, the vessels being compressed by the availen ademators attracture around; or it may, on the other hand, have a dull, lack-lustre surface, mottled with diffused congested zones, stained with bemutine, and presenting numerous coarse and bristly vessels.

In extreme cases of white softening, however, the brain-substance may be completely different here and there, and present to the touch a semi-fluctuating feel, breaking up readily upon manipulation; its central parts the forsix, seetum pellucidem, and commissure-being succes to less wholly disintegrated. Such Iscalined softenings superadded to the more generally diffused fone above described, are due to the association of plugging of the cerebral bland wassels by thrombus or embolen. The substance of the brain thus implicated may be reduced to a soft, pappy, cream-like third; or the afrace different medalla may wash away in this form by the impact of a gentle stream of water. Localised softenings, as the result of thrombosis or embolism, frequently illustrate to us the regional autonomy of the cerebral blood vessals by invading only the district of anpply of one of the principal branches of the three large vessels of the cerebrus; and thus we may have losious of one of three districts of the interior, or of the posterior cerebral, or one of the four districts of the middle cerebral, exclusively, or variously associated.

In this connection undoubtedly the area of supply of the middle cerebral is far the more frequently affected; next to this, but with far less frequency, the posterior cerebral areas suffer; and less frequently of all, the areas supplied by the anterior cerebral. The relative implication of the various branches, or rather their territories of distribution, are for the middle cerebral or Sylvian trunk as follows (the more frequently implicated branches in order of precedence):—Parieto-spheroidal, ascending frontal, ascending parietal, external and inferior frontal branches. For the posterior cerebral the order of precedence is—first, the computal branch, and, for less frequently, the two anterior branches to the unclinate and fusiform gyri. Again, for the anterior cerebral the order of precedence in morbid implication is—the middle and external frontal branch, the anterior and internal frontal, and, least frequently, the posterior and internal branch. This may be more clearly represented in the following tabulation—

Andreite Crestoni.			Middle Construct	Authorite Constrol.		
Middle and	inte	mal	Service.	Parieto-phenodal artery	Desipital artery.	
Affery.	-			Ascerding freetal _	Attender and posterio	
Auteria	-	-	**	Asometing parsently	temporal netery:	
Posteries	-	100		Ecosmil and inferior frontal	-	



Fig. 2) - Distillation of the more brought site of localized arithmings in under of preventions.

In 149 cases of localised besiens, the convolutions most frequently affected, and medullated centrum would run as follows in like order of precedence:—

- L. Upper temporo-eglomoidal gyrns.
- 2. Octpital and expense
- S. Assending frontal
- 4. Postero-parietal
- Centrum seale must defining as to anterior or middle fromal territory.
- S. Almestance,
- 2. Angelar and organizaginal.
- 8. Orbital.
- 9. Torotte and operations
- 16. Positions and assistate.
- 11. Syrus formulatus and quadrate.



Fig. 22.—Hinteractive of the more broguest sits of builded educates in order of precodings?

A further analysis of 166 cases of localised or focal seftenings (due sither to thrombosis, embelism, or to immorrhage) in the substance of the basal gaugin, and their mechalisted capsules indicate the respective proclivity to such lesions in the insane to be as follows:—The left hemsephere is in all instances of ganglionic lesion, slightly more prone to implication; the intraventricular nucleus is far the more frequently affected, the optic thalanus comes next in frequency, but the proportion does not rise beyond two-thirds the latter; the extraventricular or lenticular nucleus is somewhat less frequently involved than the optic thalanus; instly, the two capsules, external and internal, are far less often implicated, and of these the inner shares the greatest immunity.



Fig. 25.—Historian of the more frequent six of business self-rouge in order of precedence.

Of the 166 cases of softening from which these date are obtained, thirty-four were instances of homorrhage, and the sensiting number were the results of clot, usually thrombosis. The results agree, therefore, in every particular with those arrived at from a study of the locality of cerebral homorrhage, for it has been shown by Andral and Durand-Pardel, that the corpora striats are more frequently the site of incoorrhage than the thalams; and Charget expresses his opinion that

next to the opto-striate bodies, the classicum in the more frequent site of lesion.* Whatever be the origin of the cerebral homographer met with in the innane (whether the result of a periasteritis or an endarteritis), this we can safely affirm, that the same systems of vessels have the name relative liability to suffer in cases of softening, following sociusion from three-bodis, as in cases of homography fort.

Atrophy, Wasting of the grey and white medallated structures of the brain is of very frequent occurrence in insanity, but it is as a requel to the acute forms; and, in the chronic forms of insanity, such atrophy is seen to invade these structures to an extensive degree. It may be general throughout the cerebral hemispheres, whilst the bonal ganglis and mesencephalon escape implication; but, occasionally, the whole of the intescranial ganglia are involved. On the other hand, it may be footised or partial, when it may implicate any region of the train. It may be rapidly infured as the result of an inflammatory process) se is may be of extremely alon and insidious progress; or the steady progressive dissolution implicating the whole cerebrum, which distinguishes the atrophy of prounture senility. The intimate structure of the central nervous system would indicate peculiar relationships as established betwirt the individual elements which must be fully recognised ere we clearly appreciate the significance of these various focus of strophic change. Let us take as illustration of our remarks the district supplied by one of the terminal cortical arterios. Now, we affirm that the entonousy of this department demands a mutual sympolby betwixt all the constituent elements of the same; in other words, action and reaction is an established between them that any decangetient in the functional activity of the one must, of necessity, affect the other. In fact, the more highly differentiated the structural pures of a these become, the more dependent also do they matually become. It matters tittle for this terminal arterial territory if a distant branch (however large) of the same trunk he plugged, it still maintains its autonomy; but it matters very much if this minute branch itself be olatracted. The nerve-cell is dependent upon the terminal artery for a dec supply of its netrient places; the artery, in its turn, is regalated as to its calibra by the functional activity of the nerre-cell; the lymph-connective system of the negrophs is stimulated to renewed activity by the accumulating products of seeve dislategration; the nervana elements depend upon this continuous removal of effecte material for their normal storage and discharge of energy; and so, in like manner, the connective and vascular elements are mutually dependent. In no organ of the body is this natural dependence of parts so exquisitely elaborated as in the brain and, a foreign, the cerebral cortex. Terminal vessels saint elsewhere, as in the spleen, kidney, and lung; but the presence of the nervous element establishes a much more complete nutual dependence of parts. This inter-dependence of the structural elements of the cortex, due to its terminal system of arteries, is of primary importance to us in correctly appreciating the morbid appearances presented in insanity. Another factor, however, must be invariably considered with respect to all morbid letters of the cortex, and that is the sympathy betwist eliment territories which are functionally associated in their activities, and structurally linked together by "association" fibres. The former condition—the inter-dependence of parts in terminal systems—was the direct outcome of subscrate differentiation; the latter condition of sympathy betwist distant territories is catablished by an equally elaborate structural integration.

Keeping these facts in view, it becomes obvious that much obscurity naturally overshadows many pathological processes in the cortex cerebri, despite the prominence of the morbid changes presented. No one element of the timue of the cortex can suffer materially, without rapidly disturbing the nutritive equilibrium consistent with the health of the territory to which it is attached; hence it often becomes a question whether changes observed in the pervecella are evidence of primary implications, or whether they are secondarily induced through a disturbance in the circulation of the district, or impairment of the Ivanhatic functions of the cortex, in a blood crass, or other cause; or, again, as in the medulls, whether a sclerosic change with atrophy of nerve tubult is primary parenchymotous (originating in the nervous element), or interstitial (opending from the neurogia to the latter). There is every reason to believe that in the nervous contres both purenchymations and interstitial change may occur as the primary fact; that the nerve cell, for instance, may be stamped with a morbid instabillity wholly independent of any at extra agency, and this as an inherited or as an acquired condition; nor is it unreasonable to augpose that the changes in the nerve-call in physiological senescence are initiated apart from any autritive animalies and blood vascular changes, being simply the expression of the expiration of its fixed term of existence.

The very general strophy of the cerebral cortex occurring in pathological sequence is often, but by so means invariably, associated with a degeneration of its nutrient vessels, and when these vessels are involved it is to a very varying degree. Yet what is invariably found in the degeneration of the nerve-cells which, in any appreciable degree of strophy, are extensively and very notably implicated. We have here, in fact, what may be regarded as a true parenchymatous degeneration; the primary change is initiated in the nerve-cell.

Other forms of atrophy, usually more hunted in distribution, occur as the result of over series of nervous ceptres; in such cases the elessent which chiefly assumes the mortad role in the connective matrix or nenroglia, although the primary incitant was undoubtedly nervous. Illustrations are afforded in the case of alcoholism, where repeated over-stimulation of nervous elements and the waste and effete material as produced, Semand from the lymph-connective system more than its capabilities can accomplish; the result is a temporary hypertrophy of this tisms, the multiplication of its active elements (playerytes) followed by their fibrillation, and the eventual atrophy due to the encroachments of the connective upon the nervous elements. A different illustration is afforded by cases of oplisptic invanity, for here again averagion leads to degeneration and atrophy of nervo-cells through the medium of an encroaching connective; the conditions of the epileptic are, however, by no means parallel to the alcoholic, and we find that, in lies of actual atrophy of the brain-mans, there is often hypertrophy and augmented donaity due to the inordinate growth of the connective element. Instances of premature socility (or what med to be called atrophia cerebri percox) are illustrative of this form of strophy from over activity of rervous centres. Long continued or oft repeated excitement induces a similar state of atrophy, as seen in most fatal cases of chronic insanity.

A frequent cause of localised thrinking of the brain substance is the destruction and cientricial condensation of tissue in homorrhagic foci; or, again, so the result of inflammatory destruction of nervous tissue, whether arising centrally or spreading inwards from the meninges. Either of these affections occurring in injuscy will almost certainly, owing to the principle enunciated above retard the development of distant parts, so that in adult life the brain will exhibit great disparity in its two hemsepheres, and in different regions of the affected hemisphere. Such cases also illustrate the crossed connection betweet cerebram and cerebrilium, and between the cerebellium and the opposite olivary body, such as have been indicated by Vander-Kolk and Mesnert. As illustrative of this condition, may be mentioned the case of a paralytic idiot, the subject of right hemiplegia and epilepsy, who died at the West Biding Asylum, and in whom there was found ateophy, with aderous of the left corebral hemsephere, associated with atruphy of the right jobs of the cerebellum (Major); a also the case of another patient at this asylum, in which a lesion of one bemisphere of the cerebellum, of the nature of an ald hemorrhagic cavity with dense orierous walls implicating the corpus dentatum, was asso-

⁵ See descriptive encounty with illustrations of this case by Dr. H. C. Major, Journ. Munici Sc., July, 1879.

ciated with degeneration of the clivary body of the opposite side (Dadley).*

The frequency of atrophy of the cerebral hemispheres in insanity, may be conclusively shown by the post-mortes statistics afforded at the West Riding Asylum. It is hereby shown that, out of a total of L565 fatal cases of all forms of insanity, as many as 1,000 (or 67-4 per cent.) presented evidence of cerebral strophy; that the wasting was general throughout the hemisphere in 574 of these cases, although 261 also exhibited a special implication of certain areas, and that in 681 other



Trig. 24.—Himmentors of the sites of election of stropky in order of percedence.

cases partial or localised atrophy was observed. The fronto-parietal segment of the hemispheres onjoys least immunity from the atrophy incident to insunity, and we find atrophy confined to the frontal lobes in a large number of cases; in fact, in the proportion of three-fourths to one-fourth respectively. Of still more restricted areas the postero-parietal lobule appears most prope to a localised atrophy (forty cases); the contral gyri ranking next to this lobule in the frequency of their implication (thirty seven cases); the separate frontal gyri and Sylvian boundary (operculum) were thus affected in thirty-three and twenty-nine cases respectively; then followed the tempore-sphenoidal and the occipital gyri, the angular being implicated in but eight cases. The general results arrived at by a large series of weights of the brain in the insune, excluding cases of congenital defeat, teach us that the lowest average weight due to strophy is attained by instances of so-

^{*} See report with illustrations by Dr. William Dodley, Journ. Montal So., July, 1988; see also paper on "Atrophy and Schrossis of the Combellian," by C. Hebert Board, Journ. Montal So., July, 1886.

called organic dementia (homorrhagis or ischemic softenings); senile atrophy of the brain follows next; whilst general paralysis ranks third is order.

Milliary Solerosis, -So frequently has the lesion, to which this term is applied, hern recognised as occurring in the central nervous system of those dying insune, since it was first described and figured by Drs. Batty Take and Rutherford in 1868, that we feel stiffdent in suggesting a new name; although we differ from those observers in regarding its nature as that of genuine sclerosis or overgrowth of the connective element of the nervous tissues. That the mertod change hitherto recognised under this term must eventually be renamed we are confident; and that when its nature is fully understood its importance will gain for it much greater attention than it has hitherto received we are equally confident; meanwhile, we retain the name whereby it has been known for the past thirty years, as the least likely to mislead the student as to the change to which we refer. The morbid appearance presented by this lesion has been the subject of frequent examination by muny observers, but little (if anything) has been added to the graphic account given by its discoverers. Some, however, have gone the length of denying its pathological origin, asserting it to be a post-mortess change or an artificial product eleverly manufactured by the histotogist's reagents; smyloid; colloid bodies, and "miltary sclerosis," have all in their turn been explained away by some as the results of alcohol or other reagents. Unfortunand to for this theory, however, all such changes are to be found in the perfeatly-fresh brain before any reagent limbers applied, and it requires hat a short experience in the fresh preparation of nervous structures amongst the insure to vindicate their pathological import. Dr. Batty Take's description of the fully-developed lesion is as follows :-

"As a rule, the spots are unlocally, seriousually bilocaler, and in rice instances unlifteening but whatever their condition in this respect is, they possess the assessmental characteristics. A this section prepared is shoons unid viewed by the saked eye shows a number of spaces spots irregularly distributed over the surfaced the white matter; they are best seen in a tinted section, as they are not colourable by carrains. When magnified by a low power they have a somewhat luminous partly lustre, and when sugarfied 230 and 800 dissectors through they are seen to consist of radicular material, with a stream of exceedingly delitate enhancementaries. They possess a well-defined outline, and the neighbouring serve fibrational blood-consist are posted noise, and carrye round them. In well-advanced cases the plane sound denser at the rice subspaces of the spots than at their centry, and a degree of shortplane of the contiguous neity fibratic replacements is greatest. The

^{*} See especially Dr. Batty Tuke's article on the "Morbid Histology of the Brain and Spinal Cord in the Incare," Brit. and For. Metico-Chir. Review, July, 1872; also Dr. Emirren's paper in the End. and For. Madrin-Chir. Series, April, 1989.

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spots are generally colonides, but in some metamors they are of a yellowish green tint, which may be attributable to elements and. They vary much in size a unlocalize patches are joth of an inch to joth of an high is dismeter, the multilacular from over joth to joth of an inch. As many as elemen locales have been noticed in one patch, separated one from the other by fine trabecular of nervous thems."

The favourite sites of election for the development of these morbid appearances seem to be the white matter of the cerebrum, the poss and modatia, and the lateral columns of the spinal cord. In the last position it can be studied to best advantage, although it is far more generally met with in the medulls of the cerebral hemispheres. When its occurrence is noted in the brain, we find that on holding up a stained section slightly satant to the light, numerous little bright pullucid points appear scattered through the medulated structure, and just perceptible to the naked eye; they are also seen by reflected light, but not by direct transmitted light. Under a low power each of these brilliant points is resolved into a distinctly lobulated patch some 20 a to 50 µ in diameter, their colourless aspect strengly contrasting with the stained tissues in which they are imbedded. At first sight they look like a number of meepnal sized droplets of a fluid of somewhat dense unctures consistence, which have incompletely fixed with each other; and which, with somewhat oblique light, stand out in hold relief with equission or frosted pearly listre. By direct light they appear more transingent, and often seem like megasily isbulated cavities (in some cases actually being so, the contents having falles out during the preparation of the specimen). They present, moreover, three suggestive features which have a direct bearing on the question of their pathropenesis.

- (a) They are distinctly limited to the white medullated structure of the leain; and, where they approach the grey cortex of the convelutions, they, in most cases, always because, the naked-eye suffices to elicit this limitation. When they do invade the cortex, as very rarely occurs, it is only in its lowernesst zone, and then strictly along the line of the large medullated radiations.
- (b) The perivascular nuclei frequently exhibit abundant preliferation, and granular humatoidin masses freely cover the shrath of the years.
- (c) The condition is at a certain stage invariably associated with an increase of the so-called spiner-cells or Deiter's corpuscion.

If the spinal cord rather than the brain be the subject of our scrutiny, we find the lesion presents still more prominent and obtavious indirations of its presence. Its demonstration is not only facilitated by certain features here presented, but the essential nature of the change also becomes clearly evident. On examining, by usuaded vision, a stained, transverse section of a spinal cord as affected, we find a dark-atmixed area (undoubtedly solerosic in nature) of one of both lateral columns apparently riddled by numerous minute apertures; in reality, they are not opertures, but minute feel readily transmitting light, owing to their altered tissue and resistance to all staining reagents. We have here, in fact, a system-disease of the cord—a lateral sclerosis with certain peculiar morbid features superactived.

At the site of these apparent spectures the microscope reveals colourious translucent putches, irregular in contaur, assuity more or less lobulated, and frequently showing in their moist indications of various modullated fores; reproducing in other respects the appearances above described in the miliary patches of the besin. Around with unstained areas the times is always condensed and most deeply stained, and the nerve-dements are much wasted or completely replaced by aderosed timus (Pl. xiv., fig. 1). Far more instructive specimens, however, are obtained from longitudinal acctions through the diseased columns. The morbid product is then seen to be aggregated in oval or elongated elliptic patches measuring 149 a to 185 a in length by 40 a to 70 a in breadth; and in many cases the morbid material has dropped out, leaving only an irregular opening, the boundaries of which are fibrillated and never clean-cut or punched-out through the tisenes, as are certain channels of morbid origin found occasionally at these sites. The appearance at once suggests to the mind the foreible extravasations at numerous points of a congulable material which has driven the textural elements asymder before it; a suggestion further favoured by the almost invariable presence of a blood-vessel (often of considerable magnitude) running in close proximity to, or even appearing to lose itself in, the morbid focus. The morbid material is seen to consist of a congenies of oral or sub-rical segments of delicate. and indistinct outline, the sole indication of which is often the gentle curve of a connective fibre pussing over it (Pl. xiv., Jo. 2). Usually pellucid, it may be found alightly qualescent, whilst overlying and passing between its segments is an extremely fine plexus of fibrils. Some of the fibres branch dichotomously, and have the appearance of veritable clastic fibres; others arise from delicate spider-cells which are numerously scattered around the confines of the diseased patch (Pl. xiv., fig. 3). Around their lobulated contour we find a condensation of tissue, the perve-fibres strephied or absent, and the aderons tissue and blood-vessels closely packed and curving round the mais. But the more important point to note is that all the medullated fibres, in a line with the diseases tract, are in a condition of advanced disease, and end directly in this morbid focus; extreme variousity with segmentation of the medalianed sheath is apparent. These medulisted fibres, as they approach the diseased

focus, are, in many cases, seen to be regularly monthiform, segmentation of the white matter of Schwann having proceeded so far that spherical masses of medulla are strong upon the asis-cylinder like bends upon a string; at times the retraction of the segmented parties is not so great, and an irregularly various aspect ensues) while, in other cases, large pyriform masses of medulla are seen, the axis-cylinder extending like a stalk from its narrow and (Pl. ax.). Beside these variouse three lie naked axis-cylinders wholly devoid of an investing medulla, and swellen beyond their natural dimensions.

The spherical masses of seedulla exhibit a series of progressive changes towards disintegration. The early stage is represented by the simple spheroid or pear-shaped mass, perfectly clear and translacent, with, perhaps, a faint indication of the axis cylinder sunning through its centre or displaced laterally. The next stage presents a slightly-freeted clouding of its interior, followed later on by the formation of numerous extremely minute granules within. In the third atage the spheroid becomes not only full of these granules (apparently factly in nature), but its whole mass takes up a faint staining of aniline or hamatoxylin dye, whereby it is distinctly constructed with the clear apheroids of an earlier stage which remain mutained (Pl. xv.).

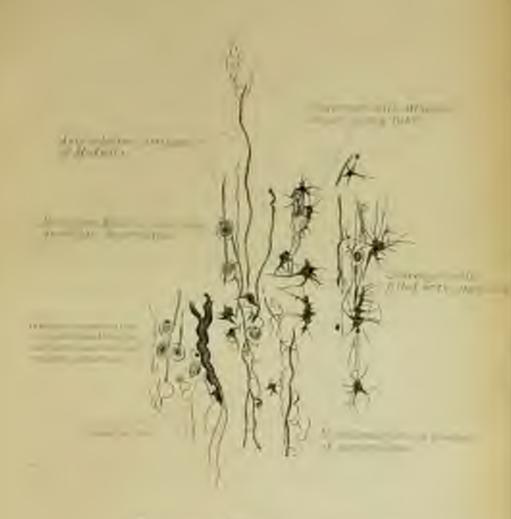
In the immediate neighbourhood of these segmented mobilisted fibres careful examination reveals a vast number of spider-cells; so delicately peliucid are these bodies, and so faintly do they take up the staining reacout, that they are readily mistaken for free nuclei, since their nucleus is always deeply stained, and this error is not unfrequently committed. At the height of the morbid activity, however, the nature of these elements undergoes a remarkable change; they then stain well, even to their ultimate ramifications, and they apply themsolves so well to the task of removing disintegrative material arising from the nerve-times that their interior soon becomes filled with the minute granules which we have referred to an clouding the medullary apheroids (Pl. siv., 6), 2, Pl. sv.). These lymph-connective elements thrive abundantly at the expense of the nerve-tisms and calarge greatly in balls, whilst their extensive ramifications pervade its structure in all directions. Along the course of such degenerating medallary fibres the head-like segmentation often produces a close resemblance to a series of large cells, a resemblance which becomes most striking by the occurrence of what looks like a fair-sized nucleus occupying the centre of each sphere | undoubtedly they have leen frequently described as cells, an error not to be wondered at since few reagents display well their real nature ; carmino and horsatoxylin help to falsify the appearance, but smiline blue-black with bright illumination seems best adapted for exhibiting their real

constitution. With other dyes they relight readily pass for model arranged along the nerve-thre at each of its moniliform segments, did we not know that the medallated fibres of the centric corrects system (unlike the peripheral nerves) are devoid both of mudei and of Schwams's sheath, being, in fact, not made up of interannular segments. Properly-prepared sections, however, show that this apparent nucleus does not compy the interior, but lies upon the exterior of the sphere, and is in reality the uncleus of a young spidercell, surrounded by a little granular protoplasm from which delicate branches radiate and clasp the subscule of myelin (Fl, av.) Being closely approved to the spheroid, it looks like a protouding nucleus, and the regularity with which a whole series of such monifiform enlargements. in a line with such other show these aggressive cells, would appear toindicate a remarkable morbid affinity. It is also to be noted that where these nucleated spider cells apply themselves, the medallated spheres have all undergone a granular change and admit of staining; where the unrelindroplets remain clear, homogeneous, and unstained, these auclested cells do not present themselves. On the other hand, these soavenges cells appear abundantly in the dense scheronic times immediately surrounding a millary patch.

The degenerative change which we have thus followed in the meduliated fibres of the spinal cord is recognisable as an all-important feature in the white medulisted strands of the creebral convolutions in chronic alcoholism, and especially in scale atrophy of the brain; the same activity of the lymph connective system precails in these cases, and (as we shall see when treating of these affections) spoler-cells accumulate around the disintegrating serve-fibre. In the cortex of the brain these spider-cells are often found (during the disintegrative stages of disease) to contain small masses of deeper stained material apparently derived from the neighbouring corre-cells (Pl. xxiii, fig. 3). Eventually the fibrillation so resulting entirely replaces the nervous tissue, so that deep stained tracts consisting of scherous tissue only are seen here and there at the more nivanced sites of disease.

Thus, in the immediate neighbourhood of these patches of military selection, we find the nervous tissue in a state of parenchymatous degeneration, which, resulting in destruction and strophy of the tesential elements, becomes the site of a genuine sclerosis. What relationship exists between the unstained patches of neilinry sclerosis and the condition of parenchymatous degeneration around?

We have already referred to the invariable presence of a fair-wood blood-vessel lying in direct contact with these patches of military degeneration. If these is closely examined we find reason for believing that the coats of the reasol are involved by extension in the morbid process, the coats are unduly thickened, the perivascular nuclei have



December 1 in the strain of the services



undergone great proliferation, the vessels are much contorted, and very frequently scaladed. We would suggest that the patch of addary degeneration may be directly due to this implication of a neighbouring blood-vessel, by the explation from the yeard inducing such swelling of the myern as to rupture the delicate investing albuminous sheath, or possibly by a direct action upon the latter. The patch undoubtedly consists of altered myelin exused in droplets from the medallated tubes and malessing sacre or less completely—the axis-cylinders forced aside with the ariginbouring tissues, or undergoing complete solution of continuity. In a large proportion there can be very little doubt that disruption of the axis-cylinder occurs, judging from the appearances presented by the section of the miliary spot. The skeleton framework of the structure, however, still remains in the form of a delicate plexus of clastic fibrils bourtifully disserted out by the process, and brought into relief upon the colourless upberules of myelin; with these there becomes blended ultimately a fine strong of fibers arising from the spider-cells around. The latter condition occasionally proceeds to an excensive extent in similarly degenerative for in the cerebran and corebellum, when we meet with isolated tufts of delicate interlacing fibres forming dense mashworks (beautifully revealed by aniline dyes in the fresh brain), which are devoid of nervous structure and of all cellular elements alike. In other instances the small nodele falls out. during preparation, or (as Dr. Batty Take observes) may be picked out with the point of a know from the hardened brain. The naked-eye appearance of these formations, as they present themselves to site in a regiment of the cord, is that of just perceptible points perfectly white and opaque, and thus contrasted strongly with the deep chrome tint of the surrounding tissue. Removed by a pin point to a glass slide, they are found to resist considerably the pressure applied to the cover glass, but upon the addition of a drop of bichromate of potask solution from pressure resolves them into tolerably large spherical hodies. Ounde and does not darken these morbid formations, but this fact might be anticipated from the change induced by the chrone salts. The effect of nitrio acid and other reagents has been studied by Dr. Rusherford; the former renders the mass transparent, and subsequently resolves it into a number of colouriess bodies about the size of a blood-corpuscie, apparently formed by the coalescence of droplets occasioned by the acid solution of the mass. By pressure on the cover glass these bedies hecome clongated and, eventually, removed entirely, leaving a delicate fibreus attoms of connective in their place. Strong sulphuric acid acts. similarly. It will be seen from the above remarks that we regard these multiple lectors not as a primary scherosic change, but as accidents eccurring in the course of a subacute inflammatory or degenerative change in the medallated nerve tracts; and that

when (during the progress of a parenchymatous inflammation of these structures) the tenies of an adjacent blood-vessel become involved. there we get the rupture of these globese masses in the nerve-tabuli and their coalescence in the patches of military deposit, which are most probably altered in constitution by the inflammatory effusion from the blood-vessel. That it is not an emential feature in the history of each inflammatory activity is sufficiently evidenced by its frequent absence; yet, it is our opinion that in the nervous tissues of the insure its occurrence is more frequent than is usually supposed.

It is well known how difficult of descentration are the several degenerative and chronic inflammatory changes which occur in the medallated trants of the brain in inamity, and how habie such changes are to be overlooked. The presence of such military spots, therefore, is one of very great interest and importance, as calling attention to the morbid state of the nerve fibres in the immediate neighbourhood."

Colloid Degeneration.—A very frequent lenion found in the brain of the insane is that which has been termed "colloid degeneration," a term applied to the presence of minute round or onal bodies, from 6 a to 12 a in diameter, which pervade the nervous structures occasionally in extraordinary numbers. The frequency of its occurrence in the brain and spinal system of the insane, its undoubtedly morbid origin, and the essential nature of the lesion indicate it as one of the most important conditions for our consideration in the morbid histology of insanity.

Some nine years ago we described as a frequent appearance in the nervous tissues of the insone certain peculiar morbid products, which, although undesolvedly derived from the modulated nerve, there a

* The following letter from Dr. Batty Tuke, inserted here by his wish, will serve to indicate how far he retains his former spunion with respect to the model shange in question;—

24 Borrerrom, May 2016, 1993.

"Duan Du, Banco Lawre,

"After seeing your sections and comparing them with my own, I am convenient that most of the laxious described by Prof. Butherfurd and myself many years ago are due, as you suggest, to myelitic changes. These changes are, for the most part, the result of the increase of the white substance of Schwarz. I am granified to find that you agree with what we said as to the autorial importance of these appearances in the mortest automy of chronic manuty. I am not prepared to give up the theory that certain of the changes we described may not be profused in other ways, and may not be due to degeneration of other brain stements. But, so I have already said, I am with years it the main.

"After your remarks on the subject it is unascensive for use to enter upon any organization prove that reliancy adjects is not the result of the action of hardware agents. Such position is resolvent quite seriously by the simple fact that the boson is often demonstrable to fresh frozen speciment. I am, yours singularly.

rolling Error Trice."

striking resemblance to the so-called colloid bodies," and we wentered to suggest their actual identity, but withheld any degesatic statement of the case, until further observation had assured us that the usually received opinion of their constitution was fallacious. Repeated observations since this date fully confirm our former suggestion that these morbid products have been too hustily relegated to the chapter of diseases of the connective framework or neuroglia; and source us, moreover, that the morbid hodies then described by us were identical in their nature with the "colloid" body. The name is unfortunate, since it assumes a collaid transformation of a connective cell sitular to what accurs in the typical solicidal transformation of the spithelia of the thyrois gland, or the same change in the elements of new growths, and we feel convinced that in this officier origin of the change the view is inaccurate. In size these bodies vary very considerably, from 6 to 12 s in diameter, up to 40 s-the former being the usual dimensions of those found in the corebral convolutions, the latter those of the regions of large medsilated fibres, each as the medulin oblougets Dr. Butty Take gives their diameter at play to velay of un inch, but this clearly applies to the minute colloid bodies of the corsbral gyri; he also notes their variability in size, quoting certain experiments of his own and Dr. M'Kendrick on the brain of pigeons. in which colloid bodies were discovered of very minute size (a.l., inch).

As we have elsewhere stated, they vary in direct relation to the varying diameter of the medicated nerve-tracts in which they are found. In form these morbid bodies are spherical, evoid, to pyrifects, their marginal contour in later stages becoming often ercoulate. They are perfectly homogeneous in structure, devoid of concentric markings, colourism and pellucid, they may become slightly singed by homotoxylin, but are wholly numflected by cornaine or amiline dyes, and they exhibit no reaction with the indine and sulphusic acid test.

A case of bulbar paralysis occurring at the West Riding Asylum showed the lower half of the medalla to be the site of this lesion to such an extent, that its sections under a low power appeared as if besprinkled by thousands of minute decylets, and yet to the naked eye no shearest appearance presented stack, and the section although pale, was uniformly and fairly-well stained. A giance at the accumpanying sketch (Pl. avi.) will reveal the microscopic dimensions of those bodies and their wide-spread implications. Yet it will be equally obvious how absolutely the limits of the grey matter of the medulla is respected. Thus, in the olivary bodies we observe those morbid formations wholly confined to its medullated sere, and nowhere implicating its plicated grey substance, except intervals lesier is transversel.

[&]quot; "Lexicon of the servous times in the brain of the tassie," Semis, Oct., 1979, p. 264.

by modulisted fibres; and the same research applies to the gray matter of the foor of the fourth restricts, and sucies of the cranial nerves.

The following is a risease of the clinical features and pathological appearances in this case :-

T. W., aged thirty, married. He is a stone-amoun, and was stated to have been make for five reachle upon his admission. Two years previous to this date he was stated to have had a paralytic stroke. Five weeks prior to admission be again had a paralytic somme tright hemiplegiat, was deprived of speech, and became depressed and survivals; great and increasing difficulty in deploit tion had been noted since this served paralytic science. On admission to the asylom he was completely speechless, could only after inarticulate smalle, or try to explain biasedf by gesture and paratonisms. He approximated all that was said to him, but showed considerable numeric. When asked to write down his name he took up the pencil with his left hand first, and then, incodering it to his right, heatated for some time as if trying to recall searching, and then three it diven in despite. He expressed numbers to hisping successively with his fager on the table. He had been a smally man, of temperate habits.

Circulatory, respiratory, and genito-tenury systems appeared normal.

His gair was somewhat unsteady, but there was no inclination to our side; the grap of the right hand is smoot dimensionly, and he uses his belt hand in lice of the right; no numeric wasting is apparent. The extremities are entremely cold, and both the feet and hands, as well as now and checks, are lived; a similar patchy livedity is seen over the whole body. He finds to whereto or spit; named close his mouth, but upons it wislely; mirro constantly dribbles from the mouth; he swallness find food only, and that with the greatest difficulty, throwing his head for back and accomplishing the set only after a prolonged effect, and then with much splattering. The rangue appears completely paralysed, lies helphood; or the floor of the mouth, and carnot be protraided or laterally displaced.

Common sensibility and reflex artisrity appear cormal and equal on both sides perception of temperature and electric sensibility normal; all the affected number reset energetically with freble farable stimulation; all special errors appear cormal. The pupils are dilated, the right pupil being the larger and some slaggish. For the years be remained a most accioes race to feeding, being in equation disagree of choking. He had no further paralytic summs, and died eventually of palasancy grantenes.

Seemery of debugs. Here's of skull thickness and very dense; no adhesion of data mater; the pia anothered is equips at the vertex, thickness, tough, and hasped up by much serous fluid. In both hemispheres there is considerable already of the convolutions, and where this wanting is extreme the sortex, after removal of the incultance, presents well-marked candiflower packeting of the surface. The whole bears weighed about 900 grammes. The thickness membranes stripped with case from all parts of the surface, except at certain sites where softening of the cortex field occurred. The suffered patieless were disposed with a certain degree of symmetry on both sides, thus —

Hight Booksplery.

Slight along lower third of ascending frontal Second assertant gyrus and cortex of inter-perietal ruleus. Stabils of third frontal gyrus. Left Beningheye.

Lever half of ascending frontal.

There apper importants and locardarter of parieto-security talent.



Position of Salaran big to Alexander Coyaly to be present of Salaran Farallysis assembly to be presented by Landau Control of the Control of



The patch of softening is generally of a greyost colour, transferent, and galathefren, its centre of bright yellow the surrounded by a greyish translatent time; it is pulpy and torn tron removal of the reperjacent membranes.

The conlidence pucketing characterising the rites of most softense waiting was disputed in the right benisplore along the standards bounding the longitudinal Some, the middle of the second festial and the angular gyrus; in the left benesphere it involved the postero-parietal, the middle of the second frontal, and a portion of the second tempore-sphenoidal convolution.

Respecting the other organs of the body, the only point mornial to note here. (layered the paragrenous condition of the long) was the alasme of mrs cardiac disease, and the prompty of generally and marted kidneys, comewhat entreme in

both instances.

In the brain, also, we find these bodies encreach open the grey matter only exceptionally, and then invariably along the direction taken by the large socialisted fracts (the tangential fibres of the peripheral zone more especially), and more rarely the intracortical arciform fibres (Pl. xvii., egs. 1, 2). We have already alluded to the same limitation as regulating the distribution of the " miliary" patches.

No theory of the connective origin of these morted formations could account for this peculiar restriction. Reverting to the case of bulbar paralysis (Pl. xvi.), we find these merbid products especially large and suitable for study along the fibres of the median raphs, the emergent root-fibres of the hypoglossal, and the arciform fibres near the raphé posteriorly. In these positions they lie either superimposed to the medullated fasciculi, or are prosed superficially by others; but, whenever their conformation assumes an elongate outline, their long diameter takes the direction of the wedulisted faccionius lying parallel to the fibres. In many instances they are distinctly seen to be an oval aveiling along the course of the meduliated fibre, and the axis cylinder can be traced through the centry of the swelling; in other instances a pyriform body presents itself, the sarrow end of which is directly continuous with a swollen and decaly stained axis-cylinder; or, again, a subgiolose body, from the two poles of which the medullated axis is continued (although not traceable) within its structure. Some of the largest examples of the elliptic form attain the dimensions. of 35 m by 37 m.

The presence of a nucleus within these bodies has been said to occur, giving, of course, much colour to the account of their cellular one in with respect to this, we stated in the article already referred to, that such bodies were always extraneous. "Occasionally a nucleus appeared on the surface or horder of these bodies, but it could always be regarded as extraneous to the merbid formation and accidentally superimposed."* Our methods of preparation now enable us to considerably extend such a statement, not only are they in all cases extraneous to the morbid

availing, but they are not five nuclei; they are really the nuclei of spider-cells (which are found when corefully looked for) attached to most of these so-called colloid bodies (FL xv.). So far from being, as we supposed, occidentally superimposed, they are important elements in the morbid role, their significance being identical with what has already been delineated in our description of "military sciences."

The "colloid" loody is, in its early stage, perfectly translacent and an minute that (unlike the milinry patch) it is not evident to the naked eye under reflected light (Pl. xviii. B.); it is likewise attacked, forming an integral part of the molalilated fibre, and, hence, not removable like the milinry deposit; it is also a single homogeneous body showing (of course) no atrana of tibrils through its structure; but these differences do not, we observe, indicate a distinct pathogenesis. Given certain conditions at a later stage, and the colloid bodies becomqualescent or granular, swell to greater proportions, hunt their albuminous shouth and coalesce as free miliary products, appear multilocular and have their structure permeated by the ramifying processes of survenger spider-cells (Pl. xiv., figs. 2, 3).

The history is the same for all parts of the constru-spinal axis contaking medulated fibres; but, as before stated, the transition stages are best studied where the larger modulished fibres exist in the region of the page, medalla, and lateral columns of the cord. That this transition from the "colloid" to the "miliary" formations had occurred in the case quoted years since by Kesteven is, to our mind, confinsive, In his case the section of medulls of a patient, of whom the conical history was unfortunately wanting, appeared under a low power to be full of minute cavities or perforations, which, when examined by higher powers, were found, in many instances, tilled with a fine granular substance, similar to what we have already described as found in "miliary" patches. This drawing of the worked groupings in the medula reproduces the appearance met with in the case of ballur paralysis already alteried to (Pl. xvi.), with this exception, that in the latter one the product of meetid activity was far more productly scattered, and the individual bodies, of course, very minute (not having coalesced into military patches). Mr. Kesteviu observes in reference to his case :-

"These capther are arragaint, scattered, without ordered of order, throughout the modalla abbrights entered in. They cannot be said to predict said a specially in any one of the elements of the organ; but if they presail at all in any part, it may perhaps be used that they are rather more numerous posteriorly than asteriorly. In one section, about the level of the columns employees, I counted several fundreds of those carmion. Again he adds:—"The immunding textures appear to be perfectly healthy, with entire absence of any inflammatory action a mether in there sign of disease of the blood vessels at the necessaring times. The merical change is restricted to these detached points, and it is wholly a matter of conjecture whether is communical to the capillaries, to in correctates of collect."

Whenever this lesion appears in the spinal usis, it will be found advisable to study its nature in longitudinal sections and by the aid of amiliar dyor.

To summaries our results, we regard both the "milisry" and "colloid" change as representing stages in the progress of a chronic degenerative affection of the modulisted three of the centric nervous system; an affection which is of most frequent occurrence in the brain of the image, and one of most sital import. A difference of opinion may exist regarding the special nature of the affection, whether it should be taken to indicate a rimple dependenties charge or one of shootic inflammatory irritation; and, in fact, the same question may be asked concerning the changes resulting from section of a perspheral nerve. In the one case, as in the other, the real origin of the affection is in the severance of the fibre from its tropics cell. It is in the diseased state of the cortical nerve-cells that we must seek, in most of our cases of insanity, for an explanation of this degeneration of the nerve three; of course, any lesion causing severance betwint the two, of may sife alony the files, will not in like manner, but the central disease in the cortical cell is equally the primary fact presented to us. The segmentation of myelin, securing in this chronic affection, differs in some important particulars from what we see taking place in degeneration from section of peripheral nerves. The latter is apparently a more notive process, and is the result of the direct morbid activity of the cellular constituents of the nerve-fibre; in its enlarged and dividing nucleus, and increased development of protophoto, we recognise (as long since taught by Banvier) the destructive agencies which bring about the segmentation and eventual destruction of the axis-cylinder and its medullary investment. In the more delicate three of the brain and spinal cord, eigmentation of the myelin occurs more spontaneously; and as the medulls separates into various nodules along the length of the fibre, it becomes less succeptible to staining by Pal's possess, which, in the healthy fibre, stains the mediciliated sheath of a deep purple, leaving the axis-cylinder untouched. H is then often noticed that the annular segments, although perfectly uncoloured for the greater part by this process, yet have a slight coloured france around both pules, the intervening meduliated someotion with the adjacent variously being normally stained and continuous with this coloured fringe. The appearance suggests an unchanged partof the modulla or its altermineers sheath at this site; possibly remains

^{*} See criginal syntale, "None of a Peculiar From of Generalar Degeneration" charged in a Medulla Oblingata." By W. B. Kesteven. Scit. and For. Mat. Chir. Rev., April, 1869.

of the replaced sheath. We must not regard variously of the fibres as conclusive of a communing degenerative change; but when extreme variously of the larger modulitied fibres in associated with their bendency to take up unline and carmine staining, when they exhibit granular contents and clouding, and especially when apparently free granular masses with proliferating spider-cells are seen, we may be quite confident that we are dealing with a genuine degenerative change; finally, the presence of "colloid" bodies or of "military" patelon assures us of the existence of the same condition.

Such extreme conditions of "colloid degeneration" (referred to by Dr. Betty Tuke as of occasional occurrence in the white substance of the brain, in which the section books like "a slice of cold sago publing") are undoubtedly states of degenerated medalitary fibres from disease of their centric cells.

How far does this condition of the medallated fibre interfere with its normal conductibility or excitability? The long persistence of the axis-cylinder probably permits a free conduction along the fibre for some time after the latter is completely denoded of its myelin sheath; and we must regard this as etill possible so long as actual severance of the axis be not affected. Such servenues occurs (as we have seen) in the accidental accompanionent of "military sciences," and then sudden interruption must occur in the conductibility of the fibre; but, apart from such an occurrence the process is one of very chronic course, the demodstion of the axis cylinder takes place very gradually, and the latter eventually succumbs to the encreachment of the sciences tienes.

Granular Disintegration of Nerve-Cells,-The winte cell becomes swoller, and assumes a more spherical contour; the cell protoplasse form its apparent homogeneity, and is clouded and obscured by the formation of granules within; the deritalised pectaplants no longer shows its affinity for the staining reagents, and because but faintly tinted by earmine or aniline dyes; the nucleus in like manner resisting these reagents. The nucleus often retires before the degenerating mass, is thrust aside, and becomes atrophied, shrunbon, angular or elongsted; moreover, the physiological pigment of the cell (samply found in a small collection at its base) becomes uniformly diffused, so that the altered granular protoplasm becomes of a yellowish tinge (Pf. xxiv., fig. 1). Meanwhile the lateral processes. have become attenuated, and eventually dwindle flows and wholly disappear; this gives the cell a still more globour aspect. In like manner, the spical process disintegrates, but the banal extension still remains, and is often notably swollen and prominent; it is seen in fresh specimens to be largely denuded of its investing medulls. These degenerate cells are mostly indistinct (from the almence of active staining), and some of the larger cells of the fifth layer in the motor cortex look like the

ghosts of their former selves. Many of the smaller cells are found simply represented as a small beap of granules retaining more or less the outline of the original cell ; the whole of the field around is the seat of much fatty granular matter, and especially assumplated around the blood-vessels. In the case of the latter we find the perivascular mason greatly enlarged, the sheath enclosing farty granules and deposits of homatine; the vessels are usually athoromatous, and fatty disintegrating branched corpuscles are spread on their exterior. The presence of much fatty matter is revealed by the fact that fresh preparations treated for a few seconds only by osmic acid (25 per cent.) tend to become greatly obscured by a minute granular deposit forming over the surface of the section. The most accurate description of granular degeneration is, we think, that first recorded by Dr. H. C. Major, and certainly before his researches it had never been shown that a primary senile atrophy of the hosis-cells occurred in scalle dementia." That observer also recorded similar changes in the cortex of aged animals, reproducing what he found in the human subject. Our further researches into the subject have resulted in the following observations. The early stage of granular disintegration of the cortical nerve-cells in signalized by certain remarkable features in the peripheral sone of the cortex, immediately beposth the pia moter. Here the medallated force running parallel to the surface assume an extreme degree of varicosity, and active degenerative changes ensue. The elements of the lymph-connection system (spider-cells) proliferate and crowd around these varicous fibres, which now become moniliften from segmentation of the myelin, so that large globose or oval bodies unstained and connected by a narrow neek constituted by the stained unis-cylinder, are seen in large numbers beneath the pas (FL xvii., 59, 1). The bodies from being perfectly columness and homogeneous, become clouded and slightly granular, and a dense proliferation of the spider-cells insinuates itself between and around these degenerating fibres, their branches forming a thick meshwork of fibres in this outer zone of the cornex. As in this stage the spider-only stain intensely with suiting-black, we get in such specimens the contrast of numbers of colouriess and somewhat lustrous spheres upon a dark hadeground of felted fibre (M. anii., Se. 1) This fibrons meshwork strikes down into the first cortical layer some distance beyond the limit of the medullated tract. This the early stage of granular degeneration is not so often seen. we much more frequently meet with the next stage, as in subjects dving from senile atrophy. It was this early stage of granular degeneration in smile atrophy that we drew attention to some twelve years ago.

^{*} West Kidling Aspirest Reports, and it.

in an article on the lymphasis system of the brain;* we there sketched the appearances presented in such a section, and reproduce the sketch here, since it has been assumed by some that these features were peculiar to general paralysis (Pl. xxiii., f(p. 1); we would here insist that ell cases of sentle cerebral atrophy exhibit this proliferation of spidercells in the earlier stages of its evolution. Not only so, but we have already sufficiently indicated that we may expect to find similar appearances whenever these moduliated fibres are degenerating, whatever he the cause.

We see therefore reproduced in this layer of the costes, in the tatty or granular degeneration of the nerve-cells, the so-called colloid degeneration already studied in the medulia and cises here. Do the same selecutic results occur which we have traced in the latter! If this layer of the cornex he carefully examined (fresh sections) in the more advanced stage of this degenerative affection, we discover here and there a few colloid bodies remaining; but, in lies of the long series of large moral form fibers, or groups of large colloid bodies, and dense filesus meshwork around, we find five media undoubtedly arising from the spider-cells, scattered in numbers about, and each nucleus forming a centre, around which an abundance of highly refractile granules callect, which are of fatty nature (Pl. axiii., for 2). These clusters of fatty granules around the free nucleus represent the disintegration of the apider-cell itself, for we often observe some of these elements full of glistening particles, and with their ramifying processes well seen lying amongst their disintegrated con-DOUGHT.

The bired reason also at this stage have their sheath taken with faity delives and refractile granules, like those surrounding the nuclei. It can be well appreciated how, under this process of fatty inperaction and removal, this layer of the sortex becomes rapidly attributed; the shrinking which accurs is apparent in the figure (P. axiii, figs. 1, 2).

In considering the source of the fat we are set at the outset of our enquiry by Calcabein's assertion that it is exceedingly improbable that levithin could be converted in the organism into tat. Now, we are aware that nucleo-albamans, albumins, and levithins (perhaps also success-levithins) are found in the cytoplasm, and the mainflated shouth of nerve fibers; and if we find, as by Marchi's method, the degeneration of this prateid matter, and a replacement by fairty granules, we must infer that the latter either arose from the proteid, or are introduced at source. Missoher has shown that in the growth of the over in Rhine salmon the wasting of missoular autotance and the fat of the nurseles, in other marsh, the spiriting up of so much proteid scatter issues in the large amount of nuclein and tecition required for this

^{*} Proc. Rep. Sec., No. 182, 1877.

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physiological phase. Hence protein and logithin do arise synthetically sold/in the body by the splitting up of the proteid molecule.*

When, again, Hofmann showed that the eggs of Muson comitoria could grow upon blood, and obtain all the requirements for the resulting grab from the protein and cholestearin of the blood corpundes, the same lesson was enforced?

The immediate source of this falty transfer may be referred to three categories:-

- (e) Pailure in the oxygen capacity of the nerve-cell; less oxygen is alterrised.
- (8) Beduced exygen value of the red blood corposites, such as we know to be the case in smility when the vital energies are at a low abs.
- (c) Interference with the blood anpply—both from arterial degeneration and want of centric and circulatory energy.

We can only here pressure that the cell nucleus plays a most important rile, since the vital activity of the autiesr chromosomes appears to be the chief agency in the synthetic metabolism of the cell; and in the fact that the nucleus stairs so faintly in these cases of senile degeneration, we see that a change has scentred in the chromatin which accessarily must be expressed in an altered nutrition of the sytoplasm. Instructive in this connection also is the fact that fatty degeneration ensures on the administration of arsenic, antimony, mineral acids, carbon annoxide and phosphorus, all of which restrict the apply of oxygen.

Pigmentary or Fuscous Degeneration.-The deposit of pigment in the nervo-cells of the grey matter of the brain and spinal cord is a constant feature in healthy states of these centres. So for from being in itself an indication of degeneration its absence should at once make as impicious of the integrity of the cell-unit, whilst its presence some indicative, up to a certain point, of normal physiological activity. In some way, as yet not clearly understood, the presence of pigment plays an important rate in the functional activity of the nerve-cell, and we need only refer to its abundance in the organs of special sense to emphasise this fact. We have seen in cases of granular degeneration, each as occurs in smile atrophy of the brain. that the surface stages of decline in the functional vigour of the neavecell is associated with a diminution of its natural pigment. If the dementia has been unhered in by evidence of long-continued and great excitement, as in attacks of sealle mants, then we find a notable degree of pigmentation of the degenerated cell far beyond what is seen in health.

[&]quot;See also evidence address by Mort in Allburt's System of Medicine, Act, "Natrotion," vol. 1., p. 198.

⁺ Quetal by Bergo, Physics. Clerk.

Epileptic insanity and the insanity of general paralesis are, of all forms of mental ailment, those most prone to excessive pigmentation, but all merbed states of the nerve-centres which are associated with expensive and frequent engorgements of their rascular apparatus lead to the production of this increase of pigment; and thus, we find the same condition of the nerve-cell in certain earshes-spinal tracts in server chorse and even in so arets an affection as hydrophobia. To class this "forecers" state with granular degeneration is we think mideading; the latter is truly a degeneration of the cell-protoclasm and may be secciated, as we have just said, with increase or decrease of the normal pigment; the former is not truly a degeneration, but may be associated with an accompanying retrograde change in the neighbouring protophum, or, perhaps, may be its immediate cause. The one fact clearly established in the history of the various psychoses is that, where excessive pigmentation of nerve cells is found, it is a witness to a bygone functional hyper-activity. Schafer* mea: -- "It seems to me that it (i.e., pigment) is usually to be interpreted as a sign of activity rather than of decadence. For there is no doubt that in other organs the presence of pigment in cells is accompanied by marked proteplasmic entirity, which may be both chemical and physical. I need only meation in this connection the hepatic cells, the pigment cells in the skin of the frog, and the beaugunal cells which form the outermost layers of the retins of the eye."

The large ganglionic cells of the cortex which are peculiarly prone to this excessive pigmentation offer us the best means for its illimitestion both in normal and abuseusal states. In fresh preparations examined straight from the freezing microtoner, we find at one of the inferior angles, or along the basal see of the cell, a small collection of golden vellow pigment, through which a number of dark, amorphous, minute granules are scattered; it appears to be surrounded on all sides by protoplasm, but is quite distinct from the latter; often it assumes a somewhat orescentio form partially encircling the nucleus. In Jegenerating cells, such as we have already referred to, the changes observed in the estions stages are as follows:-First, the whole cell becomes turned, and losing its more elliptic outline, approaches a asserowhat periferes or spheroidal consum, the pigment being notable increased in quantity. At the same time the cell-protoplous stains of an intense depth of colour with aniline time-black; so deeply tinged does it become that unless subjected to the dye for an invascally abort period the whole of the unpigmented protophum and its contained uncleux becomes observed (Pl. axii.). With this intensity of staining of one portion of the cell we have the pigmented portion wholly unaffected by the aniline or carmine dyes, and assuming a bright yellow or brownish-

^{* -} The Nerve cell Considered as the Basis of Neuralogy," Busia, 1863, p. 126.

yellow tings, and a rough granular aspect. The cell because still more globose in aspect, and its numerous radiating lateral offshoots (at first course and deeply stained) can be traced through the physicated potch up to the receding protoplasm. The nucleus is deeply stained by the usual reagents (P1 xxii.). This appears to us to be the first stage of functional hyper-activity, and we find, as constant associates with these deponerating colls, coarse dilated blood-vessels, together with lemocrytes and hematoidin crustals along the perivascular channels.

The retraction of the unaffected protophone surgies with it the nucleus towards the apex of the cell, or draws it out excentrically and to the side, but at times the invasion of the piguentary change appears at the summit of the cell when the nucleus and inventing protoplasm retreat towards the base. The nucleus itself may now become pigmented in some cases, but in all it assumes eventually a more or less irregular angular contour, losing the plamp, oval contour seen in fresh and healthy sections. At this juncture, also, the staining of the cell by aniline becomes less evident, and, with the excreachment of the ever-increasing pigmented area, faintly stained teacts or angles of protoplasm may alone remain. The radiating lateral processes dwindle down into extremely attounsted extensions and entirely disappear, the cell being devoid of all except a basal and perhaps a short agical stump; in others, a few bristle-like projections from the sides of the cell still rescain, so that it has a somewhat spiny aspect. In this stage, whatever processes remain are but very faintly stained by reagents, or have a granular, degenerating aspect, while the pigment discoloration can often be traced far down the process from its junction with the cell. The pigmented area appears to be separated from the remaining protoplasm of the cell by an investing causale of more deeply-stained material, so that when the greater part of the cell is involved in the change, the latter appears to possess a very definite investing-wall, deeply stained by atalian, with brownish vellow. granular pigueent within (Pl. xxi.) Such a sharply-defined, inderested. border gives the cell the appearance which has been described by Meynert and Lubinsoff as a "selecond awailing." At this period the nucleus, besides presenting an irregular contour, exhibits one or more highly refractile spots, probably of fatty nature; it remains always the centre around which any non-pigmented and unaffected protonlaum. which is left, collects. Hence, many cells in an advanced stage of degeneration exhibit an eccentric auctors surrounded by a narrow zone of storned (and, hence, presumably still builthy) protoglasm, deficate extensions of which can be traced as dark fibres running through the investing pigmented granular cell-mass, the whole being eaclosed within an irregular, distorted, dark-stained sclerous envelope. We have also often observed a sharply-defined cineture separating the

healthier from the degenerate portion of the cell; and it may always be noted that the processes which arise from the pigmented area are more degenerated than those issuing from the healthier stained segment. The individual granules seen in the pigmented mass are from 1 a to 3 a in diameter.

The last stage is that of general shrinking of the cell, which is, however, preceded by a partial resolution of the bright yellow or dasky pigmented granules into many highly-refractile globales, were obviously fatty in nature; whilst this admixture dissinishes the fuscous aspect of the cell (Pi. axiv., fg. 1; Pi. axvi.). In many, a still more complete transformation is apparent; the yellow tist whelly goes, the cell is filled by a somewhat bright, transforms colourless material, finely granular or molecular in part, and the outline of the cell is so faintly support out that it may be easily overlooked. These shrunken cells are also found broken up into little heaps of colourless or faintly-pigmented disintegrated molecules (Pi. axiii., fg. 3).

The behaviour of the chromophil granules has been noted and admirably figured by Meyer. In the surfier and intermediate stages these granules, greatly reduced in size, give to the swellon cell a finely-punctated aspect, the dissolution of the granules giving place to pigment.*

The granular pigment in the fresh sections is apparently smaffected by other, by alcohol, or by both conjointly; nor does it undergo any obvious change with caustic sods or funing nitric acid. All such pigmented collections, in cells advanced in degeneration, show a decided darkening when treated with osmic acid (1 per cent.), and thus reveal a certain proportion of fatty constitueans; whereas the pule cell, full of translucent material, shows decidedly a fatty reaction when so treated. We have already noted that the pigmented pertion takes up none of the usual dyes—carmine, becauselyin, or aniline. To summarise briefly the changes thus undergone by the cell, we may arrange them under three periods, then:—

Perior of mar meleicy .- (i) Swelling of well with increase of pigment.

Back staining of pestiphion, rucleus, and branches.

(2) Admining disposantion, cell more globuse; postoplasm retracting.

Science investment of cell and cinture formed.

Period of shimminted actings, — Nucleus acceptain, deformed, fully, with marrow enviroling some of purosphase.

Processor few; these, as well as dell-protopions,

fairtly stained.

Fatty transformation and development of cell.

Attorphy with shunding or rupture into a hosp
of gounder.

Period of absorption .-

^{* &}quot;Types of Changes in the Glant Cells of Parametral Labels," by Arkstple Mayer, American Journ. of Farmity, vol. lin., No. 2.

During the progress of the fatty transformation saccolation of the cell not infrequently socurs; and it is from this cause that it appears occasionally full of locali, the fatty contents of which seem to have dropped out or to have been absorbed, the walls or disseptments of the a veral locali remaining rigid. Such cells present a very extraordinary appearance (Pl. xix., xxi.), and we are ignorant as to the cause which induces this transformation rather than the more usual fearons change and strophy.

Developmental Arrest of the Nerve-Cell, At an early phase of its history the certical nervedell of the human subject is of spinercolal contour, its hand process non-medalisted, and the cell itself. possessed of extremely few processes. Not only so, but the cells are of small size, and are much more uniform in their dimensions throughout the depth of the cortex than in the fully-developed and adult brain. So atterly unlike are these young cells to the form ultimately assumed in the fully-developed stage, that the one cannot possibly be mistaken for the other. When, therefore, this type of cell prevails at a later period of life, we have unanswerable testimony to its arrested development. It might, of course, he objected that such primitive celliforms, occurring in youth and adult life, were products of a retrogressive process and not absolute peoof of their arrested development; and this view might be supposed to be strengthened by the fact that in the granular and granulo-pigmentary degenerations already described we have reproduced inflated coll-forms, which at a certain stage possess characters strongly reminding us of the primitive celli.

Such a conclusion is, lowever, instiminable, since these degenerative processes are progressive, and result in the complete disintegration of the nervous elements; since we find in these cases cells side by side in every stage of degenerative change; and since, in the great majority of the cells involved, special features present themselves which are not afforded by the cells of stanted cerebral development to which we now alloce.

It appears to us that too little attention has been bestoved upon this important evidence of developmental arrest; we drew attention to its occurrence in certain instances of spligatic idincy and imbecility in the year 1879,* and since this period we have ind frequent opportunity of verifying the observations then made.

The condition to which we allude we find restricted to the convulsive neuroses; hitherto we have failed to note its presence in simple forms of congenital defect and deaf-mution; all the instances falling under our notice being subjects of epilleptic idiocy.

^{*} Brain, Oct., 1879, p. 371,

It is important to note, in the first place, that the cortical layers presenting this primitive type are especially the second and the third layers; the larger ganglionic cells are usually in a state of excessive pigmentation, and oven presont evidence of the granular degeneration such as we usually meet with in epileptic insanity; but, spart from this, they do not assume the characters presented by the elements of the superimposed layers, and they usually retain their normal outline.

Our first glance at the cortex in the second and third layers, through a low-power objective, suggests to the mind a staining of the nuclear elements only, the faint delineation of the cell escaping attention; but it soon becomes obvious on more careful search that the nervecessils are there in apparently indiminished numbers, but the majority completely manifested by the staining reagent employed. Their appearance is made obvious, in fact, by the presence of pigmented (or size satiurless, but translurent and often highly refractile) contents which completely fill the cell.

We have allufed to these cells as spheroidal, and in many instances such is the case: but, perhaps, the slightly-pyriform contour predominates. They resemble, in fact, a number of delicate, yellow, pear-shaped bladders suspended by a stalk—the stalk being the faintlystained spex process, whilst, at the junction of the latter with the cell, the well-stained nucleus presents stack. The only elements which stain normally with the uniline dys are the large cells of the lifth layer, and these (as before states) are often degenerated.

With greater amplification the cell contents are found to be granular throughout—not as in the degenerative change previously described, such as exists in scalle atrophy, limited to one pertion of the cell, and contrasting strongly with the stained protoplasm slawhere, but nuplerally, and conrectly granular, resolved by high powers into oval or apherical houses usually 2 a to 4 a in dismeter. Such granules are often highly refractile and quite colourless, but usually are pigmented of a bright yellow that. Certain cells exhibit a faint staining between these granular bodies, giving them a somewhat reticulated aspect; this unionitiedly indicates the existence of the original protoplasmic groundwork of the cell unaffected by pigmentary or fatty change, and in more instances, a somewhat dark stained border surrounds the cell, forming a well-defined outline—this is, however, exceptional.

The coentricity of the nucleus is a notable feature, its usual position being at the junction of the apex-process with the cell, but it is occasionally appressed and flattened against the sides of the cell; it is of fair proportionate size in most cells, in deeply stained by uniline, and often presents one or more refractive spots in its interior. The branches radiating from these cells always stain very fieldy, are very delicate and attenuated, and the puncity of teanches is one of the most notable features of the cell; in the greater number of instances the apexprocess is alone detected. Most cells show only two divergent branches near the inferior pole, whilst it is rare to meet with four or five processes. We may thus summarise the features presented by these nervo-cells of the upper layers of the cortex:—

(a) Spheroidal or pyriform contour of cella.

(b) Marked occentricity of nucleus, usually spical in position.

(c) Coarse granular condition of contents.

(d) Pigmontation universal, or indications of a fatty change of protoplasm.

(e) Great paucity of branches.

(f) Peculiar characters far most marked in cells of second and third layers.

We have, therefore, in the upper cellular cones of the cortex in these cases of mental defect associated with epilepsy :-

1. The primitive type of sell reproduced as regards contour and transhing :

 But stamped of a degenerate type by the granula-pigmentary or fatty condition of its contests.

It would seem to us that the latter condition is not an active degeneration, but rather the natural state of a degenerate type of cell, as it axes not proceed to the rapid disintegration of cell-structure which pertains to the ordinary granular and "fuscous" degenerations. of later life; and, as we have seen, it is not at any time found as a partial, but as a suiversal, condition of the cell-structure. In epileptic insanity where the epilepsy is sequired at patienty or at adult age, however frequent and severe the convaluive sciences, however long-standing such phenomens have been, we never find reproduced the appearances abave detailed. However advanced the "fuscous" or granular change, we find the degenerating cells, if once they have acquired their normal developmental characters, show indications of the mature type to the very end; and, hence, we can in no way consider the very perellarconformation of these cells in epileptic allocy to be the eutcome of a primary degeneration. We shall again allude to these structed globose cells when dealing with epileptic insanity.

Vacualation of Nerve-Cells,—This change consists in the appersuase within the nerve-cell of aval or perfectly spheroidal bedien, of high reductive power quite unaffected by any staining reagent, colouriess but lustrous. In many cases the instrons, refractive quality may be wanting, and it is then evident that the spheroidal outline in that of a genuine envity or recessive, from which the former contents have been removed, or escaped by rupture; that such rupture of the cell does occur is sufficiently evident in the case of certain elements where an incomplete vacuole is apparent along the border of the nerve-

cell, which is interrupted here by a wisle opening leading into the cavity of the vacuole. There may be but one such varuole formed in the cell-protoplasm, but we frequently find many such within each cell; and, in extreme cases, they crowd the interior so as to present the very remarkable appearance indicated in the accompanying figure, where the outlines of eighteen menades were seen in a single large multipolar cell. The removal of the contents of such vacuoles may be effected by reagents, by the methods of preparation of the section, and, as we believe, by direct absorption during life through the agency of the lymph-connective system. However removed, it is evident that the original cavity maintains its former contour, and is never encroached upon by the protophism surrounding it; and in such cases where the cavity has opened up on the outer surface of the cell no retraction of the protoplasm occurs, but the contour is rigidly proserved. The pestoplassi surrounding the vacables is more or less in a state of granular degeneration, faintly stained, or pigmented and fuscous. This association of excuolation and granular degeneration is invariable (Pl. xxi.); yet the varaoles are often immediately in contact with unaffected protoplasm which assumes a deep-stained tint. and still further aids in beinging them into relief. The nucleus of the cell may be concealed from view or really absent; usually it is considerably displaced. The aspect of many of these degenerated cells in suggestive of encapsulation, through the formation of an enter delicate investing pellicle of devitalised protoplasts (see lower three cells in Pf. xxi.) The granular degeneration and the resulting vacualation and feeble staining of nerve-cella indicate a fatty change in the cell-protoplasm, and the separation of the fatty matter which fills the vacuole can, as is now well known, be artificially induced: thus in phosphorus poissuing we are aware that an acute fatty degeneration occurs in the tissues from an increased metamorphosis of albusiess, but chiefly from interference with the oxidation of the tissues, and, hence, the accumulation of fat within the cell. This is mainly due to the destruction of the oxygen-carriers—the red blood o-producinduced by phosphorus * (Foit and Baser). This rapid splitting up of the protoplasm of the cell, and the accumulation of fat within its structure, is equally induced in the nerre-cells; and the experiments of Voca and Bauer have been repeated upon dogs and rabbits by Popow, Danile, Kreyssig, and Flesch, with results which indicate that phosphorus and arrestic apparently induce a granular degeneration and vacuolation of the panglion cells of the spinal cord. Fleich, however, and, later on, Trochinski, have questioned the conclusions arrived at he other authorities, and would assign the vaccolation to an alteration induced by chrome respents. The latter emphatically asserts that in fresh

^{*} Zeiterfeit für Birlogit, vit., Poil und Bened.

preparations examined by him the change was sover witnessed.* We have on the contrary not only constantly met with vacualisted cells in fresh from sections of certain subjects of insanity, but the most extensive instance of this degenerative change we have seen, and which we have figured in Plate xxi., was treated entirely by fresh methods (sections from frozen brain being stained with aniline blue-black). We are, therefore, assured that Pleuch is certainly premature in the conclusion arrived at, viz., that vacualities is not not with in necessary tissues examined fresh, but is presumably induced by hardening reapouts. Tree-inski's resourches indicate that these changes may be ministed by the use of chrome reagents in healthy tissues; but they do not prove the artificial nature of these changes in discussed nervous centres, since we repeatedly near with these vacualited cells in our frequencement of brain.

The vacuolation is, as before stated, always associated with the granular degeneration, although the latter may frequently be found to afford no instances of vacuolation.) We used, therefore, with this change in the cell in usual correlatatrophy, and it is by no means an infrequent condition in the insanity of chronic alcoholism. In both cases we must attribute it to the accumulation of hydrocarbon in the tissues from defective exidation, which is the invariable accompanies at of ald age, and to exempte indulgence in alcohol.

Varuablation of Nucleus.—The forces condition is usually confined to the nervovell, the nucleus not necessarily being implicated in like stancer; and it is a feature state common in the favys ganglicate cells of the spitual cord on the motor area of the certex of the brain, than in the cells of the posterior cornus, or of the superposent layers of the corner; at all times they are more prominent and obtrusive appearances in the former positions.

The nucleus-change, however, is one peculiarly common to the smaller cells of the upper layers of the correx; and, in fact, is often limited to the second layer—the small angular cells, fringing externally the small pyramidal elements of the third layer. It is exceptional to find so notable and so extensive a change as that represented in Pl. xx. On referring to that drawing, we observe that slonget every cell is vacualated; some containing several vacuation, and most presenting

[&]quot;Arch, for Park, Amer. v. Physics u. for Klim, Med., Bd. vell., H.L. er an abstract of the paper by Dr. Brant Riet in Brain.

^{*} See "Remarks on a case of phosphorus possessing, with special seference to the needah symptoms during life, and the publiclegical appearance in the Brain Caster after death," by F. A. Effects and J. Middleman, Sci., Mod. Joseph. Dec., 1991; also "Variolation and Phosphorus Poissoing," by Dr. Macphoroco, Leaver, May, 1892.

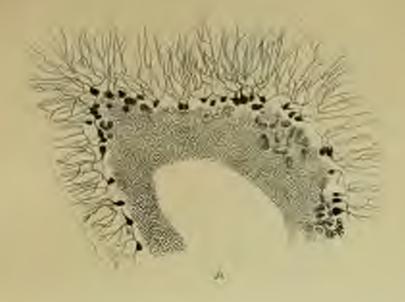
¹⁰ Vaccolation of Nerve Cells and Soptic Lebetion," Jones, of Parkettys, Feb., 1891.

minateral, distorted outlines as the result of the change undergoneit will also be observed that the nucleus is, in the universolated cells, the primary seat of disease; so that in many cases the whole nucleus is represented by a spherical vacuole, and the cell, in lies of its dark stained centre, shows an unstained bright spheroid surrounded by the stained protoplasm of the cell. Early indications of this change are revealed by a minute oily droplet in the centre of the nucleus; such droplets multiply and progressively calange, until, no longer coalescing in the nucleus, they become tree within the cell protoplass, which is also found in a state of granular degeneration (Pl. ax.). The change as peculiarly confined to the nucleus in early stages, will be more carefully considered in our section on the pathology of the insanity of epilepsy, since it is in this and certain other convulsive affections that we meet with it as a very notable and uniform change.

It may at first appear an unnecessary refinement to distinguish between the vacuolation of cell and of nucleus as we have here done; both are indications of a fatty change finally producing the self-same disintegration. It is, however, important that such a distinction be drawn, since the site of lesion in both instances appears to us to indicate a wholly dissimilar origin. The fatty disintegration and vaccolation of the large ganglionic cells appear to be induced by changes in the blood-corpusoles leading to defective exygenation, by chronic policonary affections acting in the same way, by the effects of certain politons (amenio, phosphorus) or any of the many circumstances which restrict the supply of oxygen to the tionou; the effect is a general one, but those elements in the cortex naturally suffer earliest and most severely whose nutrition is carried on at greatest disadvantage. This is peculiarly the case with all the large-sized cells of the cortex, whose bulk and greater distance from the arterial twigs is inimical to rapid restoration of autritive equilibrate, as long more indicated by Dr. Ross." These large cells, therefore, are the first to succumb to fatty change induced by any general effect restricting exidation.

When, however, we meet with a special layer of the cortex, and more especially of its smallest nerre-elements so affected, the same explanation is not valid; we cannot imagine these minute elements suffering so extensively, whilet the larger coupe from any widespecial detect in oxygenation. We can only here pressure that the change induced is indicative of an intrinsic morbid factor in the cellitself, or of its immediate structural connections. Hence we regard the changes found in scalle atrophy of the brain-cell as having an entirely different significance to those found in epicepsy and in chronic alcoholic invanity; in the latter we do not look for a cause of the

^{*}Diseases of the Novemer Special, vol. 1,





Tide on approxima (Crystellas Cieta), in a case a Spatians

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degenerative change in the blood or vascular apparatus, but in some primary condition of the nervous arrangements in themselves.*

Destruction of Nerve-Pibre Plexus,—In cases of chronic instainty, and especially where already is a prominent feature in the cerebral hemispheres, the fresh correx obtained by freezing, and stained by aniline bine-black, shows highly characteristic appearances. In healthy brain a clear differentiation of the nervous elements, the cell and nerve-fibre plexus, prevails, when fresh sections are so treated; they appear darkly-stained, and imbedded in a clear, unstained matrix, in which connective nuclei and meandoring vencin are less obviously defined. In the chronic atrophic diseases of the cortex associated with insanity the aspect is very different. Here we find much diffusiveness of staining, the matrix being uniformly affected by the aniline, or exhibiting a patchy mottling at a deep amiliae tint separated by perfectly light or faintly-tinted areas.

In consequence of this diffuse staining of the matrix, which often approaches the depth of that assumed by the nerve-cell, the differentiation of the latter is greatly impaired; and we have known these specimens thrown aside as halfly prepared sections, the blarred and indistinct elements being regarded as failures in staining rather than the results of morbid change. In all advanced cases the uniform diffusiveness of staining is much intensified by the degenerative changes proceeding in the nerve-cell and its network of teanches; but, it is important to note that, the former long survives the latter as an essential though diseased element in the cortex. It is the fibre-plaxus formed by the radiating processes (not the primary but the secondary) which are earliest implicated, and we frequently note their almost entire absence from the field, whilst the degenerate cell remains in various stages of decay.

In cases of secondary dementia, we always note the appearances now detailed, especially in the anterior sections of the bemispherea; there is the great panelty of cell-processes, the patchy metaling of the intercellular areas of the matrix, an increase in nuclei, and the field strewn with the faintly-stained, indefinite, blurred outline of degenerating nerve-cells. The patchy metaling, on closer examination, resolves itself into the fine fibrillar meshwork which originates from the scavenger-elements (spider-cells), and which has replaced the nonmedullated meshwork intervening between the surve-cells; but partly into courser patches resulting from the disintegrated nerve-cells, which

[&]quot;Consult on this point the following rooms articles: —"Variables of merucell scales in the curve in two cases of curcles concession," by J. Mappherson, M. R. Lencet, May, 1892; "Variables of stacks in Mycoodema," Dr. Wistwell, Roc. Not. Journ., vol. 1, 1992; "Variables of surveyed limited," by Dr. Skar, Roc. Mod. Journ., May, 1884, and by Dr. Wynne, Soit Mod. June., June. 1884.

have entirely lost all semilance of their former outline, or being well-defined in their lower half, become indistinct above, and fade off imperceptibly into the surrounding matrix; or they may have attached to them a few abrunken model as note representatives of the spidercells which attacked them at an earlier stage.

The fact last alluded to is important. It must be beene in reind that these destructive elements have but a transient period of existexce, and the more actively they play the part of scavengers on the
neighbouring tissue, the more rapidly (we may assume) do they
abbrillate and lose their cellular constitution, passing in this stage
through a fatty transformation like the nerve-cell (Ft. xxii, fig. 2).

In advanced instances of this interstitial strophy, we consequently may find few, if any, of these characteristic organisms present themselves; but the resulting fibrillar meshwork is always perceptible. The fatty change of these tissue-elements involves considerable discollection by the use of osmic acid, which is requisite in the fresh process of examination, and it therefore becomes importance that a very dilute solution of the reagent to employed, unless the firmness of tissue permits of its being entirely dispensed with; if the usual 5 per cent, solution be employed, great obscuration of the tissueelements may result.

The delicate, unprotected processes of the intercellular nerve-plexus lend themselves most readily to the mavages of the scavenger-cells; they success sooner than the spex-process, the cell stock and the hand axis-cylinder process, which persist latest (Pl. xxiii., fg. 1). Hence, as we shall find in most instances of secondary dessentis, it is this plexus which is surliest and most exposed to decay, and from it issues that interstitial atrophy which progressively advances to the termination of the case; it is a destruction of tissue which can never be replaced.

A dire estimate of the nervo-cell as the elementary unit of the nervous sections is now universally recognised as countial to an intelligent appreciation of the phenomena of cerebral activity, whether from the physiological or pothological standpoint. That the absence of the elaborate cell-mechanisms of the cortex, and their imagined replacement by a perfectly homogeneous structureless matrix in which the nerve-fibres lost themselves, would introduce into our problems in the present state of phraiological science, inextricable continuon, is selfevident; since the phenomena of functional differentiation would then remain to us a performing mystery, and the simplest correlations of used would await an explanation.

If for these remons only, we may safely exalt the nervescell to a position of the very highest importance in our problems of mind. It is on this account highly important that the nervescell of the cerebral cortex should be the subject of careful andy by all interested in psychological medicine; and that due attention should be paid to the conditioning of its functional activities, and to the results of its nutritional impairment, disease and death.

In our chapter on the histology of the cortex, we have dweltsufficiently upon this structural unit in its relationships to the surrounding elements, to indicate the intricacy and delicate adjustment,
established between it and its physiological environment. Suspended
within a main direct connection with the lymph channels surrounding
the ideal vessels—or pather its own special nutrient capillary—the
nerve cell becomes liable to any influence, however trivial, disturbing
the blood stream in its neighbourhood (Pl. xiii.). A quickened sirculation, a retarded flow, an amenic state of cortex must influence the
functional activity of these centres of feeling and thought 1 a vitiated
quality of the blood, or the presence of toxic agents introduced from
without, or elaborated within, the economy will all affect them in a
greater or less degree: whilst the activity of the lymph connective
system in the removal of the effets products of functional wear and
tear, will play an all-important role in the same direction.

That delieste system of lymph-connective elements, to which we have alluded as permeating (in the normal state) the whole of the cerebral mass of white and grey substance, takes a more active abare in the pathogenesis of mental decadence than any other; and the more the question is investigated, the greater importance, we feel convinced, will be attached to these elements in the processes of disease as affecting the nervous centres. Their physiological indications are clear; they are the scavengers of the brain; and the evidence obtainable renders it now incontroversible that they are liable to excessive and impair development under certain merbal conditions affecting ceretaral naturation and repair. In the normal condition of healthy ceretration these elements, far from being obtained persons, are so delicate and pellucid that they often escape detection; but that they are universally present can be readily serified by special methods of assumination.

Whatever leads to increased waste of cerebral nearine; whenever structural disintegration is allowly proceeding either in nerve-cell or fibre; whenever accumulation of debris occurs from slicease of the vascular tracts, then we invariably note an anymented activity registered in these scavenger-elements of the brain. That their activity is in direct ratio to the functional activity of the examinal neurine tissue, we think there can be no doubt; nor that with each accession of the nerve-tide they are stimulated to increased activity in the removal of the products of waste and the plasma effected from the venezis. In Anally stars, however, they never assume the hyper-

trophied form, the deep staining, the course fibrillation, the rapid satistiplication, and the evidence of obvious intracellelar digestion, which are so readily observed in pathological states (FL nny.).

Tissue-Degradation from Over-strain. - In certain pathological states, aotably in general paralysis, we shall find that these organisms play an all-important part, and are most prominent factors in the morbid proces; but we desire here to draw attention to their connection with certain states on the very borderland of pathology, vin, instances of Pover-strain," where cerebral activity has been too long or too intensely encouraged, and mental tension has been associated with worrying and distracting circumstances. In such cases, as all of us are aware, there is a risk of permanent damage, and most of us are sequeinted with instances of such. That sustained mental work indulged in by the healthiest subjects, yet with disregard to physiclogical laws, will reach (if persisted in) a limit where the pathological barrier is passed, is undoubtedly true; but that the introduction of the element of worry, interfering with the amouth current of intellectual work, has a specially vicious influence in this direction is a fact of such far-exaching consequences, that it cannot be too fercibly or too often insisted upon. No amount of rest from mental labour, no change of circumstances, nor absence of all shatertony agencies will, in the cases we refer to, restore the montal faculties to their former vigour; it would seem that an actual destruction of tissue has occurred as completely as if excised by the scalpel, and that restitution to the former state is impossible. We believe that in such instances an actual degeneration of overbral-tissue has been entailed, that the lymph-connective system has received just such a stimulus beyond the physiological limits necessary to ordinary repair, that these physiclogical units become pathological factors, and the nervous elements themselves successib to their raparity.

Tissue-Degradation from Active Pathological Processes.—
In consecutive dementia following upon scale insanity, we have estated that what we have pertrayed above occurs to a very wide extent in the cortes of the cerebram. That it occurs in a minor degree in all attacks of mania and scale melancholis is also very probable, judging from the almost invariable signs of instability, and alight enfectionent of potential nerve-energy in most apparent recoveries: but for consecutive dementin the actual fact stands out as a prominent and highly-significant feature, that there is very obvious destruction of the nerve-filer pleam of the cortex, and that the interceilular elements have degraded in type to the purely connective, or have undergone latty disintegration and removal.

We regard the appearances presented by such cases (already described, p. 337) as indications of the storm which oversweps the region, and as oridence of repeated engacement of the cortical vessels attendant upon the hyperactivity of the nerve-elements. We see in such instances the coarse and torthous blood vessels, the frequent minute extravasations and deposits of hematoidize in their neighbourhood, and other changes incident to bygone attacks of excitement; but in the presence of the spider-cells and the degraded type of inner, we see an activaly-destructive agency at work, which has, therefore, a very different significance to the vascular changes associated therewith.

In no case of acute amountaient of maria or melancholis, fatal in early days, have we met with these organisms as pathelogical factors: it would seem that the normal elements play their part as thosescavengers, with a fair promise of success up to a certain limit of time. In fact, the duration of the excitement is of primary importance in the elaboration of these morbid factors; this we shall have occasion to see again and again in our clinical studies of insanity, where the time-element is of such great moment that it is customery to assume [arbitrarily of course, for many exceptions occur] that cases of mania of over twelve monthly duration may be relegated to the chronic class of the insanc. There is, indeed, but little doubt that beyond a pertain period, varying for each individual's nearotic resistance (whether it he within or beyond twelve months' duration of mental excitement), these elements multiply and take up a pathological calls, preying upon the thomes whose functional integrity in healththey subserve.

Another factor should, however, he taken into account in this connection—viz., Age. The tendency in advancing age is towards a multiplication or overgrowth of these elements, so that in smalle dementic (as we shall see) they form the natural associates of the atrophic changes which accompany the decadence of mind. This tendency is, therefore, emphasises in all acute insanities occurring in advancing years; and we may regard age as an important element in determining the consecutive dementic resulting from all forms of insanity.

Tissue-Degradation from Disuse. The process we have been commissing is one of genuine degradation of tissue percoind by over-stimulation of certical areas; but, a degradation in type may also be slowly induced (according to well-known physiological principles) by lowered functional artivity or disuse. The atrophic changes then resultant are induced through the agency of the same searchger-dements which remove the degenerating tissues and replace them by their own shrillated atroom. We are thus inclined to explain the profusion of these spider-elements in the cortex of most domesticated animals, notably in the sheep and in the tune rubbit. In the former, the pix is firmly attached to the surface of the brain by these elements, and requires considerable force for its removal; in the latter, sections

through the cortex exhibit them in great abundance in the peripheral zone. Similarly they are to be noted in the cat, dog, ox, and monkey in varying slegrees. Sir J. Crichton-Browne has called attention to the disparity in weight between the brain of certain wild and domesticated animals, taking as a forcible illustration the reduced weight of the brain of the tame, domesticated duck as contrasted with that of its wild representative. The decadence from disuse of certain faculties essential in the wild state is thus actually expressed in weight, and we neight infer that in all alike a degradation of tison- initiates such stropkic changes. In man a similar change angrests itself as occurring in those instances where a long life of unusual mental and bodily activity has been suddenly interrupted by circumstances which restrict within an extremely limited range his further activities; in such instances, how frequently do we date the first evidence of mental decadence from the consation of the customary active life of the individual. The preference to "die in harness, rather than rust" is a trite saying, dictated by a full appreciation of the physiological principle of the decline of faralties with their disuse.

Since then, those lymph-connective elements play so superiors a role in the degenerations of cerebral tissues in mental disease, it becomes an interesting spection to enquire how far their pathological development may reveal itself to the nabed-ope examination of the morbid brain! The presence of unnatural attachments betwict the pia-arachment and subjacent cortex as morbid afficient is conclusive stridence of the presence of these pathological elements; even undustruments of connection, apart from actual adhesion, may indicate their presence (as we have seen, occurs in the brain of the lower unimals), but their presence is the cortex already softened by an acute process, such as occurs in general paralysis of the insanc, is occumpanied by the most pernessured appearances of morbid connection.

Yet, although their presence is confirmed by the mortial adhesions to affected it by no means follows that the absence of adhesion necessarily excludes them from this site; in fact, these elements in a state of morbid proliferation in the soler zone of the cortex may be frequently seen where no asspicion of eitherent membranes exists (Pl. xxiii., 69, 3). In the latter case, their appearance is usually estimident with considerable fatty disintegration of times, these elements themselves succumbing to this change, and very considerable intersitial strophy is apparent.

Another indication of the ravages of these scaverger-cells is afforded by the various atrophic states presented by the cortex of the chronic insure —of course, exclusive of such strophy as is dependent upon obviously gross inform—apopteetic foci, softened traces, &c. (FC xxiii., fg. 1). Such strophy is always attendant upon the degradation of tissue to which we

new refer, and its distribution maps out with colorable arcumer the areas chiefly implicated by these agencies; and, surreever, the localisation of such wasted areas has an important bearing upon the history of the scute attack preceding the consecutive atrophic change. It is also a very noteworthy feature with respect to the degradations of tissue so resulting, that the peripheral zone of the cerebral cortex is far more prone to implication than deeper regions, at an early stage of the proous; eventually these elements attack the deeper layers and the medullary strands, but their destructive agency is chiefly exhausted upon the nerve-fibre plexus formed by the naked, unprotected processes of the cells. The importance of this fact is at once evident when taken in connection with the receviling View as to the autonomy of the cell and the significance of its ramifying processes; the cell represents the sensory unit of wind, and the processes whereby its connection with similar units is effected represent the relational element of mind, the means whereby a change from one state of feeling to another is rendered possible. With the breaking-dows of these perve-fibre plexumes the relational element of mind progressively suffers, the intellectual vigour wanes; whilst the purely sensuous element may long hold its own.

The nerve-cell itself eventually succumbs to a disintegrating process, possibly secondary to the destruction of its processes; and (as we have already indicated, p. 537) relies of each cells, in all stages of dissolution, are to be seen scattered throughout the costen in advanced cases of consecutive dementis. The tissue-destruction is of such a nature as not to lead itself to the processes of repair; and, in the appearances so presented, we must learn to recognise a persented sental cofestionest.

From the clinical and pathological aspects of scate and chronic insurity we feel justified in making the following assumptions:—

- Acute immity may be regarded as a very general implication of the sphere of mind, and hence of a wide-spread disturbance of the cerebral cortex.
- (2) Its operation is decidedly concentred upon the motor or fronto-parietal section of the hemispheres, judging from the disposition of morbid appearances and the resultant strophy of the secondary dementia.
- (3) That in certain forms of mental decangement (the fulminating psychoses as they may be termed) approximating to the epileptic and convolute neuroses in their character, a more local origin is often presumable; and in such instances we often find sensory areas peculiarly prope to implication.
- (4) That even in the more universal implication of acute imanity, the full force of the nerve-storm falls with unequal strength upon special areas; as indicated in the uncured wreeks of our saylum.

chronics, whose besins exhibit a very variable and unequal distribution of the wasted areas.

(5) In its destructive (aplication of the cortex, it is the intercellular nerve-fibre plexus (the relational element) which primarily and principally suffers.

(6) That the strophic state induced in the consecutive forest of dementia results in a greatly-diminished brain-weight, as long since

indicated by Sir J. Crichton-Browne."

Let us rousider these more in detail. Our studies of the pathology of insunity would impress us with the important principle, that whenever the nervous elements of the cortex are primarily the sent of disease originating mental derangement, then the implication of the sphere of mind tends always to be more generally or universally involved; but that where the percechanges are secondarily induced as the result of rascular disease, the greater tendency is shown towards a local or partial implication of that sphere. In the former case, the intimate connection of the nervous system may partly explain this more general implication, as it is scarcely possible for any serious affection of any cortical area to be established without involving neighbouring and distant territories closely associated in their functional activities, and, therefore, in organic connection with each other; but, in the latter case, the territorial independence of the arterial supply and the terminal nutrient twigs of the cortex impose, as is well known, a fembring character upon most of the nervous affections originating in vascular lesion. Hence we find that, whereas in ordinary uncomplicated acute innanity (seate mania or melaucholia) the territorial implication is a very general one, although invariably expressed at certain sites more than at others; yet, that in certain insunities (e.g., that accompanying general paralysis), special sites of election are taken by the diseased process, one area being affected after the other, until ultimately the localising character of the ailment fides into a widespread, general implication. So, again, in alcoholic invanity, the resulting dementia is poculiarly apt to exhibit this partial and restricted character (especially in certain forms of sensesis to which we have previously alluded); upon the other hand, the gradually advancing, yet universal implication of mind in the decadence of senile atrophy would imply not as in the former a vascular, but a primarily nervous origin.

[&]quot;The statement made by Crahlton Browns is to this effect.—"Consecutive and thronic dissection a form or form of mental disease, embracing to many of the instates of our tunion hospitals, whose pervous systems have been irreparably dissauged by the sours steams of disease, or who have subsided quantly into the depths of introos degeneration, it represented in Table 11. by a brain weight only a shade greater than that of organic deventury the average for make being \$210.3 greateses, and for females 1129.5 greatenes. Rooms, tol. it, " On the Weight of the Brain and its Component Parts in the Instance."



The second secon



Tale teadency of primary nervous implication to share in the universality, which also characterises nervous affections of housic origin, should not blind us to the fact already emphasised, that in the widest-spend mental disturbance the morbid implication is always more strongly expressed in certain directions than in others; and that, in a certain sense, we may with properlyt apeak not of insanity but of Insanities, multiform in their nature, and all pointing to certain definite weakened areas in the material aghatests of mind. In this sense we have long been accentenced to appreciate Dr. Hoghlings-Jackson's dicta when dealing with the reductions of insanities; and in this connection "a plea for the minute study of mania," by Sir J. Crichton-Browns, is well worthy of attention." It is in this direction that we may yet hope for much enlightenment at the basels of clinical observers upon the question of cerebral localisation, or, at all erents, for facts confirmatory of the results of experimental country. Dealing, however, as we do here, with scental operations, the alienist has a field before him which extends far beyond the present limits of possible physiological experimentation.

The superficial wasting of the cerebral benispheres in insanity is far more general and extreme in the fronto-parietal segment of the brain; in fact, as we have before seen, in three-fourths of all cases of cerebral atrophy we find the wasting himsel to this division. It is the so-called motor, and intellectual, and inhibitory sections of the hemisphere par emellence which suffer most excerely as the result of acute insanity and its sequels; not the assumed sensory section. The more localized wasting, on the other hand, where limited to individual gye, exhibits the same tendency to locate itself in motor areas, affecting in cerebro of frequency the centres for the (a) lower extremities; (b) the upper extremities; (c) the face and tongue; whilst the separate freetal gye come in order of frequency between the two latter. Last of all come the sensory areas of the temporo-sphemoidal, occipital, and angular regions (fig. 24, p. 511).

A very different feature is presented by the localised softenings, due, in far the greater proportion of cases, to thoushesis of the cerebral vessels. Here it is distinctly seen (fig. 12, p. 506) that the aemory areas of the upper temperosphensidal, occipital, and cureate divisions are most prone to become involved; the autor areas of the ascending frontal and postero-parietal following in their turn. In mental derangements associated with (I determined by) these vascular affections, therefore, we find the most persistent hallucinations of hearing; and this is a suggestive feature taken in connection with the pronuncus to the implication of the fourth or sphenoidal branch of the middle cerebral, and the occipital division of the posterior

cerebral seteries. Alcoholic immitty, purhaps, affords us the best instances of the kind. What it is that determines the more frequent implication of these seterial channels than the other branches of the same trunk, we cannot at present even surmise.

With respect to the question of localisation as affecting the frontal division of the hemorpheres, it will be occusionally found that the atrophic sequels of insanity exhibit a very notable wasting of the frontal lobes; the atrophy to which we allode is so extreme as togive this lobe a peculiar pointed aspect, reminding one strongly of the corebrum in the rabbit as regards its general outline. We have mot with several instances—three especially marked cases -of this extreme strophy of the frontal lobe. Its importance depends upon the constant association of a definite series of symptoms, which seem to us to have a localising eignificance and to which we drew attention in a former article on cerebral localisation.* The symptoms to which we refer comprise a poculiar form of dementia, in which extreme somnolence prevails, and an utter incapacity for the most trivial mental effort. Unlike many dements, their attention can sciencely be even tucceentarily aroused, and then only to be followed by a lapse into the performs torpor which simulates sleep. This condition of sommolence, lasting day and night, may continue for months, or even years, ere a fatal termination ensues. The subject is a perfect automaton, moves only when poshed along, requires feeding by hand, but avallows the below of food when placed in his month, and him in hed torpid and motioniess, giving ulterance to no articulate sound. In one comthat of an aged descented female, in whom the framework, muscles and integement, testified to extreme alrephy-such a condition was minced during the last two years of her life; but, or lony carernals, evidence of nerve-instability was forthcoming in the sudden, unespected outburst of frantic position, in which she struggled, kirked, serestical, and aware, employing a very free vocabulary of abusive epithets. the outburst would had but for a minute, when the profound torpor again ensued. For morths prior to her death she rescained bed-ridden and during the whole of the period, except whom record for feeding in a state of apparent profound sleep. Feeding had to be pursued with care, as the would often neglect swallowing the food placed in her morth to lapse into her drower state. from which she was roused only by shaking and continuous exhorthisom

In mother typical one the patient was the subject of general paralysis; is this form of discone the symptoms sow referred to, and the troutal strophy associated therewith, are not of very infrequent occurrence, the condition is one of long standing, and must not, of

[&]quot; Rick Med Jame, vol. 11, 1883.

course, be conformed with the temperary staper of the congestive and apoplectiform accorns incident to this disease.

That extreme atrophy of the frontal lobe may occur in congenited cerebral affections without the symptoms here allieded to, is evident from the case of an epileptic hid at the West Riding Asylum, whose frontal gyri presented attenuation to never riband-like folds; and in whose restlements predominated. Yet, in his case, intelligence was so far extinct, that he clowed no appreciative recognition of any objects around him, and could not be taught to feed or clothe himself, or attend to any of his bodily wants; he mechanically sucked everything placed in his hands; could just utter imperfectly his own christian name. All his senses were intact. Golts, in his removal of the frontal region in dogs, noted that the senses were intact; there was great irritability and restlements; they had a stopid, fixed expression of eye; in following a bone thrown before them they apparently forgot their object and passed it by.*

Horsley and Schafer charred temporary stupidity in monkeys, from whom the prefrontal lobes had been removed; but more to our point at present are the observations of Professor Ferrier, who, upon removal of the prefrontal region in monkeys, noted the following facts—to quote his own words:—

"Instead of, as before, being actively interested in their surroundings, and cornwelly prying into all that came within the field of their observation, they remained spatiestic or dell, or deced off to sleep, respecting only in the remainion or improvious of the moment, or energy their holizoness with mothers and parpowdow wanderings to and tru. While not also body domestic, they had but, to all appearance, the family of attention and intelligent observation." *

It is impossible, upon reading this description, not to be struck by the remarkable similarity presented, in the mental deterioration of the patients to whom we have allested, to the animals in whom the prefrontal lobes had been removed.

^{*} Pyloper's Action, Bd. 2000., 1994. + Posteriors of the Receive, 2nd edit., p. 401.

PATHOLOGICAL ANATOMY OF GENERAL PARALYSIS.

Centents - The Series and its Montecros - Early Implication of Vaccount Toyota-Vital and Mechanical Effects-Effects on Lymph-Connective System-Entra-Cellular Digestion - Kilo of Phagosptea, or Suscenter Colo-Character of Scaveoger-Element - Its Vascular Process - Fencius Degeneration of Nerver Cells-Three Stages of Mortal Evolution: -Inflamentary Engagement-Implioution of Pin Amchanal-Nuclear Proliberation on Adventitios Paralysis of Arterial Tonics - Dapolesia - Eculation - Homowagi, Toursedations - Arachsoid Hamseringe-Serond Singe - Hypertrophy of Lymph-Connective System -Fracous Change and Removal of Nerve-Cells-Nature of the Destructive Process-Early Implication of Apex Process-Third Stage: Fibrillation and Mingley. The Spined Cont - Spined Coase to Four Groups - Evalution of Parada-Tabetic and Spartic Paraplepic Forms Pathingenises of Transcent Tabetic Forms-Changes in Vascular, Connective, and Nervous Elements-System-Implication of Lateral Commun-Secondary to Cortical Legister-Respects Systematic Barrier-Chronic Percedynation Myelms-Dependent on Gradual Depresention of Curtical Cells-Ampulrophic Form-Depresenting of Counsal Elements to Cervical Associated with Descending Lateral Sciences in Done-Lembar Regions-Combaned System-Implication of Columns-Pseudo-Tabetic Farms-Ationic Tabes-Loss of Knee-Jerk-Anoresia-Planting Pains and Sentory Symptoms - Genutin Tabetic Forms in General Paralysis.

The Brain and its Membranes, ... The earliest indication of morbid change is certainly presented by the Vascular tissues; turgescence of the vessels of the pia, great distension and engorgement of the cortical arterioles, are seen as the apparent result of an irritative process in their tissues. The perivascular lymph-channels are the site of a nuclear proliferation and segmentation of protoplasm, often so enterious as to sutirely control the enclosed vessel from view, Certain methods of staining and preparing nervo cisase are peculiarly. adapted for exhibiting this change in the early stage of general puralysis; and it may be stated that the usual chrome methods are so projudicial to the merbid texture, that these who evolutionly adopt then must have failed, as a natural small, to approciate the true nature of the morbid change produced, and the very serious implication of the vaccular tracts which resues. This development of nuclei along the lymph-sheath embracing the vessel must be regarded. as a genuine inflammatory condition; accompanying it, we observe the usual eight of an inflammatory process, a transmission of the fleid contexts of the result into the lympholiannel and tions beyonda disperiors; or an escape of anotherid leucocytes from within the vessel through its costs, and collections of hometoidine creatals, frequently at the segular bifurcation of the vessels or between it and the peri-Vancular at cath.

The results of this inflammatory process are very damaging to the blood-vessel itself; changes are induced of a vital and mechanical nature. Fital, in so far, that the neighbouring inflammatory state of the abeath appears to paralyze the tunion muscularis of the smaller arteries, and the natural elasticity of the vessel becomes also impaired; a relaxation enough which favours in a high suggestatain of the blood current, ancuriousl distensions, and, on further mechanical obstruction, rapture of the vessel. Nechanical, in so far, that the uniform support of the adventitial sheath is impaired or lost, or its nuclear accumulations encrosed on the inner of the vessel and compress it; or its transmidation-contents in like manner (or otherwise) prejudicially affect the other tunies of the vessel. At a still later period the abouth is yet further damaged by the numerous branching processes of cells extravascular in position, which play so important a role in the morbid process, and to which we must now direct attention.

In this, the second stage, there proceeds a remarkable development of the lymph-connective system of the brain. The cells, which are usually described as "glia cells," or what we have in our anatomical section alluded to as the "flask-shaped elements" of the neuroglia, undergo a wandrous transformation, the real significance of which does not appear to have been hitherto appreciated. We will first describe those elements in their pathological developments; and, subsequently, allude to the important coe they play in the morbid evolution of this disease." As before stated, these elements are small flank-shaped cells with a comparatively large nucleus at their greater extremity, which latter stains but faintly with aniline-black, whilst the pectoclass of the cell itself remains unstained, and so delicate as to be recognised with difficulty in healthy states. Each has a connection by a delicate process with a neighborring blood-vessel, and, in frozen sections fresh examined, exhibits serveral radiate branches so fragile, and excessively delimie, as on he only seen after a keen search, since they remain wholls unstained by reagests (Pl. xxvi.). In the morbid change to which we now allude, these flak shaped cells calarge very considerably into great americal-like masses of protoplasm, often exhibiting subdivision of the nucleus; and, what is of great import, their protoplism now steins deeply with uniline, although not so intensely as do their nuclei. From this extraordinary cell of resteau form radiate on all sides numerous branching fibrils, forming an intricate and delicate network around it as a center, all of which branches, even to their

^{*} Intra-cellular eligention is now an established perhalogical fact, and the remarkless of Metachinkoff here extended largely the vib of cartain cellular organisms in the elimination of mortid material. The term playocyco, which he employs he these large vells active in the removal of effets subternal in the frog and other cells himself unusuals, we have surpleyed when referring to the spader-cell; but we prefer the tirm someoper-cell for those fixed time-organisms which, as we have seen, here an active physiological and pathological with. See Metachings's Original Articles, Firebow's Archive, cola next, xonis,

most delicate subdivisions, are readily stained by the same reagent. These cells have been termed Deiter's cells; they see all characterised by the presence of a vascular process; has well-prepared specimens show us not one, but often several, such processes distinguished by their greater diameter, their deep staining, and their termination in a nucleated-mass of protoplasm upon the walls of a blood-vessel (Pf. xxvi.). The student's attention should be deawn to the fact that in healthy states of the cortex these peculise neuroglis elements may be readily distinguished from the nerve cells, apart from their contour, by the fact that their nucleus alone stains faintly with amiline, whilst both protoplasm of cell and nucleus of the nervolements stain deeply; whereas, in the diseased state so which we allude the morbid elements act like nerve-cells, both nucleus and cell-protoplasm, as well as nitimate fibrils, become deeply tinged by the dye, so that, in some cases, they do not look unlike nerve cells; and a few may even be misraken for such, until the "vascular process" is detected. This different reaction in the diseased state is doubtless due to the increased and unnatural vitality * of these protoplasmic masses. These lymphconnective elements (normally spread as free cells, except for their eascular bronch, throughout the neuroglia/ramework of the brain's multiply by nuclear division and segmentation of the cell-mass until their numbers are so predigious as to rival the densest groupings of nervo elements in the same region (Pf. axv.; Pf. axiv., 69. 2). Their normal off-shoot from the purent-vessel, or its should, explains their more deute distribution on either side of the vascular channels; but they may permeate every tract of the cortex, from the peripheral sone to the deepest layer, and are, moreover, often formed sleep in the medullated structure of the brain.

Whenever a branch forms a new connection with a blood-vessel, at its junction with the sheath there is invariably found a und-atest must of protophasm, often undergoing subdivision, and this process is specialised by its greater size and depth of staining; the other processes are much finer and more delicate, take a more tormous course, and beauch into numerous still finer ramifications (Pl. axvi.). Co-eval with this morbid transformation, we find the nerveo-ille present. immubitable evidence of a degenerative process Planty, Sq. 1; Planti.). The merbid condition of the cell has itself been described by some authors as inflammatory in its intrinsic nature (Microejoreki); but, when carefully studied, we wholly fail to recognise an inflammatory condition, we see but the evidence of a true degeneration due to acute nutritional anomalies, and fail to observe any notable difference be-

^{*}Even agreemedle in vertain tilement states state more intensely than in health. - 30, early stage of faccous depresentian. but subsequently the married becomes progressively less interest.

tween the changes through which these sells pass, and those of the cortex in senile atrophy, except in the greater tendency to a true steatosis in the latter state; and still less do we perceive the distinction from what is observed in the "fuscous" change of the large cortical colls of the epileptic's brain (F), xxii.)

Where the certex is extensively invaled by the absordance of lymphconnective cells, the nerve-cells will be found to present every stage of degenerative transformation from an incepient change in molecular consistence and coarseness to a broken-down residue recognised only as a faintly pagmented patch, acaresiy preserving its outline as a cellular structure (Pl. xxiii, fig. 3). What is highly important for us to note in the connection between such cells and the neuroglin-elements just described. The processes of these morbid elements apply themselves to the nerve-cells, surround and embrace them closely; whilst the latter are often overlaid by one or more of these spider-like bodies, still maintaining their connection by a long stroight process with a discout equillary (Pl. xxv.).

Occasionally, the branches appear directly connected with the neevecell and at their junction a minute nuclear-like mass, more deeply stained, is seen. Wherever we find the nerve-elements much invaded by their strangely transformed congeners, there we observe advanced degeneration of the cell, to describe which in detail would be to repeat the description already given of pigmentary or fracous decay (p. 527). It may be stated here, however, that the opical process appears to suffer at an early stage of the disease, and disappears often before the cell itself is very gravely implicated.

As the nerve-cells undergo more and more serious discregarization and dwindle away, so these elements of the nearoglia multiply and throw out their protoplasmic extensions in all directions around, the down blood-vessels, draw the perivascular sheaths by their contraction out of their normal course so that they become (as represented in the figure, Pl. xxvi.) pelled in this or that direction into innonsentile argular or funnel-like extensions by the attached processes of these cells; the vessels themselves become contorted, and drawn from their acquail direction.

Then a further change eneme, the cellular elements appear to reach a limit to their morbid activity, and expend their remaining sitality in a dense fibrillation. The protoplasm of the cell dwindles down as these menhworks of fibres form around it, and the nucleus alone remains as a cert of nodal point from which this fibrillated mesh radiates as from a course, its branches interfacing most intimately.

^{*}Such included is dislated dense the fillisted times of abroat microscopic dimentions recomming operar in the surebellium. Their support has not to our knowledge been previously recognised.

This stage of dense ferrillation and disappearance of the cell protoplasm is the third stage in the merical conduction of yearest purolysis.

To recapitulate, we have three well-marked steps thus defined whereby we may trace the morbid implication of the cortex.

- A stage of inflammatory change in the susies adventitio with excessive nuclear puliferation, profound changes in the variable changes, and trouble changes induced in the tissues around.
- A stage of extraordinary development of the lymph-connective system of the brain, with a parallel degeneration and disappearance of serve elements, the axis-cylinders of which are desuded.
- J. A stage of general fibrillation with shrinking, and extreme atrophy of the parts involved.

We may now proceed more fully to enquire into the indications affected us by the morbid changes characterising the above stadia.

Stage of Inflammatory Engorgement, - It is in the vessels of the pix that lesions are earliest witnessed, and the lymphatic sheath in that in which the inflammatory change originates. Here it is that, in the earliest stages of the disease observed in the brain of a general paralytic, the initial vascular demagements are first to be noted; and cases proving fatal at an early stage, through the agency of any interourrent affection, may exhibit (beyond a slight general cloudiness of the araclmoid along the course of the vessels in the fronto-parietal regions, and a very slight increase in the toughness of the membrane; no other naked-eye evidence of disease. The membranes may be alightly more difficult of removal than in health, but show no genuine adhesists to the subject cortex. Yet sections of cortex examined microcopically all show a notable increase in the nucleated protoplaunic cells of the arrestitio of the vessels of the pia, which tessels are also large, distended and often toetures; together with a general, though slight, proliferation of the most superficial flask-shaped cells of the peripheral zone of the cortex, and the years of the intima pin resting upon it. From these cells of the pin long delicate processes are sent. out extending deeply down into this layer; and, in fact, simulating in this early stage an appearance often found normally in the cortex of certain dossesticated animals (the shoep, pig, rabbit, &c.). That these changes constoence in the vascular supply of the pla-araclmoid. gradually extend into the cortex, and eventually penetrate its deepest layers, namerous examinations have established beyond doubt.

In a further-altranced stage of this disease the soft membranes become for more gravely implicated. The nuclear proliferation around the vessels of the pin, their distension and engargement (from paralysis of the vital contractility of the nuncular mat) lead to a very free extension into the member of the pin. The connective tratecular lying between the intime pin and arachnoid (which are so especially loom Annual Street Street





and plentiful within the sulci separating the convolutions) become esturated with a duid exudate, present a swellen and gelatiniform aspect to the naked eye, streaked with opaque lines, or assume a patchy, or a general and uniformly diffused epal-orence; whilst to histological examination of sections they rereal beautifully-disposed meshworks of connective fibrile, rich in cells, and permeating in every direction the subarselessed space. Into this space exude the cellular and fluid products of the inflamesatury sheath. This tendency to the scenmelation of exadate in the subaraduoid lymph-tisms receives a marked increment at a later stage of the disease, for, when atrophic changes occur in the cortex as the result of impaired nutrition and degeneration of nerve-elements, a great compensatory sensitiv of this region is established, and the membranes become fairly water-logged. The strophy, which is the result of a genuine sclerous change in the cortex, is necessarily more marked in the sulei than over the summits of the gyri, the area of certical surface involved in the one case being far greater than in the other, and, in consequence thereof, the gyri become mercoand and affermated—the thinning of the cortical layers being the most marked feature.

The remels in the pix loss the normal support received from the opposed gyri, and, as more compensatory effusion occurs to fill up the space left by the receding brain structure, so the natural support received by their walls becomes becomed, and in the discussed state of their parietes there becomes established a strong tendency to homorrisagic transadation, or to actual rupture and homorriage. Such homorrhages may be slight and merely punctiform, and are frequently observed; or blood may be transfused into the spharachnoid space and a fibriaces coapulum form upon its meshwork; or, as we often see, a film of blood may be exusted upon the epicerebral surface, between the pik and cortex; or, lastly, the delicate and perfocated anothroid may permit an extravanation on to its outer surface, in that the antidural space may thus become the size of a more or less extensive hemorrhage. The latter, or so-called meningeal humorrhage. may be a mere delicate film of blood, or a simple rooty staining of the erachnoid surface, or a thick cosquium of blood extending over the greater part of one or both hemispheres , or a coagulam within a firm fibriness or organising investment completely encysted; or, again, a thin, but tough, glutinous or fibrinous pellicle, slightly rust-statued, may be peoled off the surface of the dura, forming one or other of the varieties of the so-called arathroid cysts. These encysted homorrhages (which are by no means peculiar to general paralysis, although frequently associated with this disease) appear to be due, in these cases at least, to an initial extravanation canned by the supture of a diseased vessel in the pinamichanid, and to the subsequent repture of

needy-formed results within the organising clot. In notes of these cases does it appear to us to have a direct inflammatory origin in the membranes. Beyond these extravasations and infiltrations of bloodwhich invariably occur during an advanced atrepted stage of the disease, we find similar conditions established within the cortex itself Here, also, the blood-vessels less the normal support given them in health by the approximation of the perivascular walls, which permit of a limited, but a definitely restricted, expansion. In strophy of the cortex, however, these channels become exormously enlarged and filled also with existate from the contained vessels; this distension of the perivascular changes favours the ancuramal dilatations already allisded to, and the eventual rupture or transmitation of the contents of the blood-ressels into the surrounding space and neighbouring tissue. Hence we get, in all such cases, evidence of extravasated blood in the form of historiciline crystals, which often occur in argregated hears, especially in the mighbourhood of degenerating nerve-cells. It would appear that the estural subsidence of compennatory fluid into the rulei, and the much greater recomion of the strophic cortex allowed for by the special position of the walls of the gyri, is unfavourable to the formation of adhesions; for it is a fact that such merbid adhesious in general paralysis are almost strictly limited to the summits of the gyri, where the picarachroid is in close contact and does not permit of the accumulation of sevority to nearly the same extent as in the sulei. As the inflammatory state of the lymphatic shoult of the vessels extends to the deeper layers of the cortex, other grave disturbances accessarily ensue, and this leads us to the second stage of the disease, which is characterised by the extraordinary development of the lymph-connective system of the brain.

Second Stage. The implication of the perisascular lymph-channels by the energious production of protoplasmic masses on their walls, and the blocking of their channels and impairment of the vascular tissues, directly affect the autrition of the nerve-cells. A granular change in their protophese casses, and fuscous degeneration of their contents leads to their ultimately breaking-down into a fine molecular man of debris. This, together with inflammatory exudates from the yearely, must be removed; but the lymph-channels are not in such a condition as to ensure this removal of effete material. It is at this juncture that the orpylementary lymph-connective element somes into play. In the normal state, maintaining its connection with the vaccular walls by its Deiter's process, it either, by circulation of protoplasts or by contraction of the latter, removes such effete material from the cortex. Now, however, these organisms rapidly increase in size and numbers, forming large anosbold masses of protoplasm, which

apply themselves to all the degenerative elements around, and by a process of intusuaceptica ressors such particles into their interior. For long, these spider-like cells, or Deiter's cells as they have been termed, have been recognised by several authorities in the cortex of the general paralytic, and very varying and conflicting statements have been made respecting them; by some, they were regarded as metausorphised leasargtes wandering from the blood-reasels; by others, as a simple proliferating connective, which by its pressure and strangulation destroyed the neighbouring nerve-tissnes; others, again, saw in them no special connection with general paralysis, since they have been recognized in various diseased states of the brain. It is true that these seganisms are met with in other affections of the nervous-system, but simply because they play a most important vilin the pathology of nervous diseases, and it is only when their real functional endowments are perorited that we recognise their important significance in the sortical testam of general paralysis.

The failure of the asmit lymphatic tracts to remove effete matter from the beain reacts by calling forth an increased functional artivity in these lymph connective appendices in the negrogia, a true functional hypertrophy causes, and these spider-like elements apply themselves to the task. They become the "phagocytes" or scoreagers of the risons; live, thrive, and multiply upon the degenerating protoplasmic masses. of nerve-cells and their extensions, and all effete material lying in their neighbourhood is ultimately appropriated to their use. These active acarengers are also destructive of the living tissues; they affix their sucker-like processes to any portion of their structure, said at the point of juncture we invariably see a small speck of active protoplasm containing a quelers, probably in process of subdivision. Occasionally, several of these active elements are seen completely covering a large nervocal), which is in an advanced stage of decay, or acareely visible, forming a more pigmented melecular groundwork. They are usually noted in great abundance in the deoper half of the peripheral or outerment layer of the cortex, and, being manifed with nerve-cells, are here peculiarly clear and defined. At this site their destructive access makes itself felt upon the medallaced move-three, which at this depth run parallel to the surface of the cortex. These, therefore, are the first nervous structures to be involved, and the spiral processes of the syramids are also amongst the first to undergo dependentive change.

Third Stage.—Like all actively growing elements, those also have only a limited existence in this condition of morbidly-exaggerated function. The cells throw out immunication the processes; and as the thirday menhworks increase, so the cell-perceptanu, at whose expense they appear to be formed, desirales down and eventually disappears. Hence we have here a veritable substitution of fibrillar connective formed out of the effect material afforded by the atrophic nerve-titues, a gennine degradation of tissue. The process does not appear to us to be at all whin to the destructive influence of a compression from scierous invasion, but rather that the presence of the scierous element is explained by its production out of already-degenerated nerve-clear-rate

The Spinal Cord .- The spinal symptoms associated with the cerebral distariances of general paralysis have long been a subject of intense interest to the pathologist, and much diversity of opinion exists relative thereto, less as, perhaps, respecting the infrience solure of the morbid change as the most of implication of the spinal timuselements and the initiatory conditions upon which the lesion depends. As is well known, the spinal cord is by no means uniformly implicated in all cases of general paralysis; nor in the selected site of morbid change a constant feature. A large majority of cases of general paralysis pass through the various stages of the disease without any notable spins? symptoms, apart from those due to implication of the bulbur nerve nuclei, until the latest spech of the affection in reacked; whilst in others, from the very outset the spinal ayapterna are the most prominent feature of the rans. In other cases, again, the spinal symptoms appear to bear a definite relation to the various stages of ecrebeal distortance, and vary in their nature pari posmwith the latter. Thus we may be permitted to group cases usually encountered into four arbitrary divisions.

- (1) In the majority of cases we have, as the only evidence of spinal implication, a somewhat general funination of cutaneous sensibility, associated with a sluggish or greatly-dimenshed knee-jerk, alternating later on with (or supplanted by) increased knee-jerk, usually as the direct sequel to a convulsive or apoplectiform secure. Later on, in the discuse, paretic symptom may predominate, and contractions be established; but these follow in the wake of pronounced cerebral distorbances (convulsions &c.), and appear, in fact, to be initiated thereby; whilst the cerebral implication throughout has been all along the more emphasised.
- (2) Here there is a second group comprising from the very quart notable teletic symptoms, the cerebral often so greatly in absymber as to accuse the doubt whether we are not here engaged with a gamine teles described based spinal origin. The distortance of semation, the abolition of the deep reflexes, the staxic gail, are all so prominent that we are upt to attribute such symptoms to a primary implication of the condition. And yet, in this teletic form of general paralysis, we most amonly witness complete subsidence of the special spinal symptoms, the tabetic gait passes off, the knew-yesk returns, and then the full





. . .



Servicement of the coreless symptoms is established; or, what is not infrequent, the sensory implication of the cord becomes a motory affection, and spastic paraplegia replaces the anaesthesia and ataxy.

- (3) In yet another series of cases the mater spinof enounding are from the first a most notable feature; and symptoms indicating a symmetrical descending scherosis of the lateral columns are early apparent, amally as the sequel of convaluive sciences, a mode of implication which appears to us of special frequency in general paralysis affecting these subjects who are addicted to alcoholic indulgence.
- (4) Lastly, there are those cases where no spinal symptoms whatever are noticed, the derengements being perchal throughout (15-6 per cent.)

In explaining the features comprised under these orbitrarily-constituted groups there has been a tendency to regard the later-evolved cerebral derangements of typical general paralysis established in a well-marked talonic case as due to an ascending change—i.e., to propagation by direct continuity of diseased tissue; thus making a system-change of the spinal could the originating factor of the subsequent cortical lesions of general paralysis.

And, in like manner, the subsequent establishment of motor apinal symptoms (specific percepleges) has been regarded as a direct transference. of morbid implication arross from sensory to motor columns of the cord, or to a descending lateral science is having direct continuity with cortical lesions. It appears to us that there is little evidence in favour of such views, which would seem to originate in too service an attention to the great law enunciated by Wallen. The Wallerian degenerations do secount for much in the pathological reductions of general hamiyais; yet it appears to us to be much strained by efforts to entablish its row when, after repeated attempts made to trace such dependrative continuity of tissue, the best observers have invariably been fooled. It is a notable fact that, despite frequent and most careful examinations of the spinal levious of general paralysis, we yet fail to trace the continuity of descending changes of the internal columns of the cord with the legmental structures of the pens. We are apt in paying too street attention to the operation of this important law to overlook the transfer of disease to distant parts of the nervous system through implication of higher realiss, not by direct continuity of diseased times, but through the vancouster agency operative upon nervous tracts in physiological sympathy with their higher centres.

Vascular System. - Nearly all cases present an apparent incomes in the number of the venezis of the pasterior columns. The appearance

is, however, deceptive, in that there is not an absolute numerical increase in the vessels seen in transverse section, but an increase in their size, due to long-continued engargement, which renders them a most prominent feature in the sectional fields. Limited to certain divisions, or scattered indiscriminately over the whole area of these columns in andine or homotoxylin preparations, they at once obtrude themselves on our notice. The individual vessels, although of large size, have a lunen greatly-diminished by the encroadment of their thickened walls; the nuncular cost of the smaller vessels is distinctly hypertrophied, presenting the appearance which has been so well described by Dr. Johnson in the renal ressels in chronic Bright's disease. In other respects, the vessel appears free from morbid change; the lymphatic channels are not unduly distended, no proliferation of ancies is observed, and no other evidence of inflammatory change in the vessel's tonics or explates from its channel, such as wree described in the vessels of the cortex. The change appears to be one of simple compensatory hypertrophy, induced by the engaged condition of these vessels demanding increased contraction on the part of the arterial muscle to carry on the circulation of the cord. Just as in the renal vessels, the muscular coat hypertrophies to overcome the languid circulation of the organ, so the manufacts of the rachidian arteriales increases with the engorgement of these columns, induced by the changes occurring in the cerebral cartex.

The Connective System. The stellate cells found normally throughout the columns of the cord, and which are the representatives of the delimite neuroglia-elements spoken at as the fank-shaped logical of the cortex cerebri, do not, in the healthy eard, form so prominent a Senture in transverse sections. In discused states, however, they not only enlarge, but multiply greatly, and their proliferation as "Deiter's cells" is a notable feature in the columns of the cord in general paralysis. In fact, these spider-like cells accumulate in east numbers, and especially along the vescular tracts, giving these regions a desper coming in uniline preparations quite appreciable to the naked ere. Such tracts, consequently, look at first sight like arlerosed tissue, until microscopic examination resolves them into large numbers of desply-stained spider-cells. They are by no means peculiar to general paralysis, as they are found in these columns also in chronic inflammatory conditions, in all long-standing congestions of the cord, in alcoholism, and in smile atrophy of the cerebra-spinal system. A pessine sciences, such as is seen in primary tabes, we do not find; no finelypenciated connective tissue puredes these columns of the cord, so that the millorally-deep tings of stained preparations is not so frequent a feature here. The increase is simply that of the lymph-connective costem, apparently stimulated by the engaged condition of the

Vascular apparatus and the defective elimination dependent thereapen.

The Nervous Elements,—As shore stated, these often remain little or not at all implicated. No enlarged exist-y-linders are observed, no awalling of the modulited sheath, no proliferation of model; nothing which can be translated into signs of inflammatery implication of the nerve libre. The quider or "sourcepercells" (as we have termed those elements) appear powerless in their agency upon modulisted nerve tubes, and it would seem that their destructive agency directly affects only the unprotected protoplasmic structures, the nerve cell, the axis cylinder process before it attains its modullary investment, or the protoplasmic transless of these cells. The connective elements, because, effect the degeneration of the medulisted tube by the pressure and enconcinnent of adecess shrillated tissue, as seen by the invariou of the finely-punctated tissue in other forms of ascending selectors.

As to the site of the changes just considered, the posterior commissural zone of the cord is a special favourite site of election. Here the cascalar tracts almost invariably exhibit the change described, even if nowhere else observable. The columns of Goll are likewise often implicated, whilst a third favourite site appears to he the posterior radicular zone, the mortid change extending from the entrance of the innermost fibres of the posterior roots into the card along their course until they enter the posterior comm. The proliferating soavenger-cells, as before stated, usually follow the course of these morbidly-distended vestels, and, by their depth of staining, nee sot the posterior column into a riband-like bond involving one or both radicular source, or compy the inner wedge-shaped extremity of Golf's column, or form a deep-coloured bult immediately behind the posterior commissione. In such cases the substantia gelatinosa of the posterior come is riddled throughout by similar dilated bloodchannels. This increased vascularity may percede the whole of the central grey matter, as will as the interal columns

System-Implication of Lateral Columns.—When these columns are involved, the indications presented are those of chronic and mild congestion leading to eventual scleronic degeneration of the times. In fresh preparations such changes may not be appreciable to the naked eye, and (sulfike the estandary degenerations from focal festion in the cerebrum) they are not revealed, except to histological examination. In the cedinary forms of descending lateral sclerosis consecutive to destructive lesions in the motor area, the degenerated columns burgap themselves by their greyth translations aspect, showing through the pin just as the ascending scherosis of genuine takes reveals stead by the same peculiar peacly translations; in the posterior columns. The

naked-eye examination, however, may indicate its existence by the altered contour of the cord, the column implicated being often shrunken, contracted, and the normal symmetry distorted. Again, section of the fresh cord in the former affection (descending lateral sclerosis) exhibits the degeneration to the naked eye as a greyish, becomish, or fawn tint, and a translucency due to the diminution of medullated shouths of the nervo-fibers, as also to the prepositionace of cularged blood-veuria and connective elements. In the lesions of these relumns in general paralysis these appearances are observed only where the process has been unusually active; in the great assignity of cases they require microscopic examination of specially-hardened chrone-specimens to reveal the degenerative condition.

What is observed in such sections prepared and stained by the usual means is the doop tint taken up by the diseased tract; the remels and trabecular tisone and intervening connective being so far predominant as to take up much more of the staining reagent than the healthy tracts, where the axis-cylinder is ensheathed by its normal amount of meeting; if, before staining, such sections are "cleared up" and examined by transmitted light, the peculiar translucent aspect of the diseased tracts also suffices to mup them out accurately to the naked eye. The intimate nature of the process is rescaled by histological examination. It is thus found that, in the posterior half of the lateral column, reaching back to the posterior corns, but bounded externally by a tract of healthy nerve-tissue—the direct cowleder tract—there is a dark stained aren in which the nerve-elements are in a state of inflammatory disintegration. The medalisted fibres have lost a great part of their myeline, and are notably diminished in size-their axis cylinders, havever, stall remaining; here and there the nerve fibres appear larger than menal, the medulia awaiien-faintly tinted with the day (an indication of its necrotic stage)-and the axis-cylinder either displaced laterally or entirely absent. These enlarged fibres, soon in transverse sections, are but the avoiler somilifers portions of the didntegrating nerve-fibes divided at its largest dissueter. To indicate this fact, longitudinal sections through the column should be made, and examined in the fresh and in the mounted state. The nerve-fibras will then be seen to be undergoing marked inflammatory change; a large propertion may exhibit almost empty medullated sheaths, exclusing a stillcontinuous axis cylinder; in most cases the axis cylinder is itself interrupted, displaced, contorted, and nevered along its overse; the heir degenerate filters show irregular culargements along their course, often presenting a notable-moniform aspect due to proliferation of the nerve-nuclei, increase of their protoplasm, and segmentation of the medalla thus induced; in fact, an active destructive process, in which these aucleuted masses of protoplasse forming the cellular element of





each segmented node of the perve-three take the chief part, a process cearly enunciated by Ranvier. If these longitudinal sections are examined in the unmounted state prior to the clearing up with oil of staves, the fibres are also seen to have freely scattered over them a large quantity of compound granule-cells—another indication of the inflammatory change. These granule-masses are immediately but upon the use of this clearing respont, but may be temperarily preserved by mounting in glycerine.

Returning to our transverse sections of these columns, we find the trabecular times largely increased, its radiating cells enlarged, and much fine punctated fibrillar tissue (deeply-stained) intervening betwirt the degenerate nerve-three, and following out especially the direction of the vascular tracts. The vessels themselves are unduly large, and very prominent in the diseased part; their walls are invariably thickened, the muscular tierns, more especially, being thus increased; whilst the smaller vessels exhibit the change more notably than the larger; in many cases the lumen may be almost obliterated. The lymphatic sheath may be distended, but this change is not so perminent a feature as in the common form of lateral arieroris from occubral focal disease; nor, upon the other hand, does it approach to the symarkable change seen in corresponding tissues in the cortex of general paralysis. The vessels the uselves usually form centres from which connective tissue radiates into the surrounding nervous structures placed in the axil of the trabecula; the open lamen, the thick wall of the vessel, and its econimally distended sheath are prominent objects, and the radiate cells around thrust out their processes into the finely-punctated consective in which the recyc-fibrils are embedded. The appearance is almost suggestive, at first eight, of primary interstitial change; but this can scarcely be maintained in view of the fact that the vessels may be traced through healthy tissue (such as pass through the direct cerebellar columns) into the discussed focus, and that only on their arrival in the inflamed some do they present the morbid appearances described. The name at stement holds good for ordinary descending sclerois, accordary to cereival lesions; here, also, we witness the implication of the ressel only upon its arrival at the site of morbid activity. Again, we do not meet with the enormous nuclear proliferation upon the walls of these arterioles, such as we found in the cortex; the adventitia is, as a rule, deroid of any undus proliferation. It is not, however, intimated by this, that a true parenchymatous muritis may not induce such nuclear proliferation by extension of the inflammation to the vascular tracis and interstitial tissue; but, that, in the abonce of this change, we probably have positive evidence of an inflammatory extension to the blood-ressel not having occurred. A still more important indication of the change being primarily a parenchymatous neuritis is found in the

tendency of the lexion to assume a genuine system-distribution; and the argument holds good for these changes in the lateral columns of the cord in general paralysis, just as Gowers indicates that it does for the system-disease of takes devants.

Assuming, then, that the changes met with in the lateral columns of the cord in general paralysis are of the nature of a parenchymatous rather than an interstitial myelitis, and that this change tends to establish a system-disease of the cord, we naturally ask how the change is primarily induced. Why do the nerve-fibres take on the inflammatory condition described ! There can be little doubt that the true explanation lies in the destructive and irritating lenions proceeding in their trophic centres in the cerebrum; for we may safely assume that the cortical cells in communication with such motor fibres also exert a trophic influence over them." The initiatory change-viz., the increase of the nucleated protoplasts of the medallated nerve-tubuli, we do know occurs as the result of its separation from its trophic centre, as by section or other lexion; and we trace in the cortex lesions of motor cells which indubitably should lead to the changes described. It is a significant fact, also, that one of the earliest indications of the change is the extreme vascularity of the tract affected, in itself, possibly, the expression of the trophic disturbance. To summarise these views :-

- 1. The change is induced secondarily to the certical lesions.
- It establishes itself after the Wallerian principle; does not overstep its systematic barrier, although it may originate simultaneously at several distinct and distant parts of this tract.
- It reproduces, in easying degrees of intensity, the character of a chronic parenchymatous myelitis with notable vascular change.
- 4. Its intensity never approaches that of the descending myelinis due to large focal lesions of the cortex, and being in its essential nature dependent upon a gradually-advancing degeneration of cortical nerve-cells, and not a sudden or gross lesion such as the former, the irritative influence on the cord is greatly minigated. The changes found in the peripheral nervous system, their vascular tracts, and the muscular system have been well described by Dr. Alfred Campbell in his article will be found an exposition of the view of a primary tonic origin for these peripheral changes (as opposed to the view now propounded) given in a masterly manner and with good illustrations. Dr. Campbell found extensive changes in the vags (as did Colella). I in

^{*}Sec in this connection "Anomia as a Cause of Degenerative Changes in the Culumns of the Spinul Conf.," Report in Learns, March 50, 1886. Also "Destruction of Central Grey Matter in Rubbits on Congression of Aceta," (Ehrlich and Bringer)

the phrenic, the mixed spinal nerves and their peripheral terminations, the small blood-vessels of the nerve sheath (as did Goodall and Ruxton),* and, to a less degree, the spinal nerve roots, the cranial nerves and their nuclei of origin (Wigglescorth, Wiehle, and others).

Although, in the greater number of cases, the change found in the posterior columns of the cord is limited to the vascular distension above alluded to, and the abundant production of scavenger-cells; yet, in cortain instances, we sreet with a genuine sayolitis, the site of which is usually the posterior radicular cone, often extending across towards the columns of Golf. Here, the nerve-tubuli have veritably undergone inflammatory change, and, as will be described more fully in the lateral columns, the medullated should is found awollen, faintly stained, the site of nuclear proliferation and disintegration of myeline. Many of these enlarged tubuli show no axis-cylinder or one which is displaced laterally, and the increase of connective along the vascular tracts often leads to a notable diminution and distortion of these columns of the cord. The ordinary grey degeneration of these columns seen in toles dersolis is not in these cases reproduced, but a much more arritative process, highly inflammatory in character, and closely resembling the scleronic conditions of the lateral columns with which it is often associated. (Pl. xiv., figs. 1-3; Pl. xv.).

Combined System-Implication of Columns, -Do the changes found ever resemble those of amyocrophic lateral sclerosis! Such cases present a very maid downward career, which is mapped out in the easilier stage by micessive apoplectiform and convulsive seizures; the latter are usually unilateral, often limited to the facial muscles, and unaitended by loss of consciousness. As a sequel to this seizure or "fit," as the friends term it, a lass of power in one or other limb is almost universally found to exist ; usually it is the arm that suffers most after these attacks, the grasping power being greatly diminished, and the subsequent changes in the muscular power and nutrition of this member may be disturbed in advance of the lower extremities. Three paretic states at first may be very transient, or but a day or more; the locamotion continues unimpaired, the general natrition of the hody may be unaffected, and exercise he taken without inducing fatigue for a period of one or two years subsequent to the enset of the cerebral disturbance. Then, there appear symptoms which inaugurate the advent of organic changes in the cord; the becomoter powers may still be good, and considerable muscular force may be exhibited, but equilibration is distinctly disturbed, and although the patients may be able to approximate their feet in the erect position, and close their eyes with but slight awaying, not they stagger considerably in attempting to walk in a straight line (beel

^{*} Beste, 1992, p. 241.

and toe). The guit gradually indicates advancing staxy, the legs are thrown out in disorderly fashion, and the tendency to come down on the heal is also recognised. Yet, in lieu of decreased or abolished knee jock, we now find either that it is normal in force and range, or that it is greatly increased. At this stage also, we get ankle-elected in one or other limb as a frequent accompanishent. The tongue now is protraided jerkily, and all its movements are attaxic, the lips may be exceedingly tremsloss, has deglisticion is unimpaired.

Attacks of maniacal excitement may now precede sudden failures of power in the lower extremities, and we find ankle-clones and the kneetap reaction in excess. The arms now rapidly emaciate, and become correspondingly defertive in unusualar power; in fact, the most marked feature of the case at this period will be this extreme strephy of the upper extremities, in which the more specialised muscles are not picked out in the manner of the ordinary progressics miscular strophy, but the large massles of the shoulder-joint, the musculature of the arm, and the flexors and extension of the foreign are chiefly involved. No contractures of the arm secur, or mystatic increase, but complete flaceidity, and the legs do not participate in this sub-acute atrophic state. On the other hand, the legs show more marked sensory disturbances, cutaneous sensibility becomes blanted, there is increased awaying in the erect position, the guit may be that of an unsteady jog-trot, or more notably ataxic. Exalted knee-jerk and closes may still exist; but, muscular enfectionent now rapidly supervenes; the limbs tend to exhibit spannodic fixation, but are more frequently kept stiff and rigid by voluntary effort. The patient is now bedridden, and at this stage is usually profoundly demented. Implication of the estately nerve-more becomes evidenced by altrest complete loss. of cutaneous sensibility in one or both legs, and is pechably, also indicated by a sharp distressing cry often repeated, as if the poor patient were the subject of sudden lightning-points. Ataxy is also now present to a very notable degree, and the knee-jerk (up till this period normal, or unduly exaggreated) is completely abeliahed; plantur reflex is also absent. By this stage the subject is in a pitiable condition, belyless in limb, utterly incapable of attending to the most trivial wants, exceedingly timid, and the apparent sufferer from fulgarant pains; there is profound implication of the bulbar nerves, deglatition being so far impoired as to make the effort both usinful and full of risk; whilst softened food placed in the mouth is apt to be retained as a bolis in the cheek-pouch for hours, unless care be taken. The extreme consciution of the upper extremities is also attended by supid attempty of the facial messeles, loss of all adipose tissues, and a sharpened pinched expression of the features.

Reverting now to the amyotrophic form elescribed, we note first,

that the spinal appear consecutively to the cevebral derangements; and, as before stated, are almost invariably ashered in as the direct secults of apoplectiform or convulsive seitures. The resulting pureus is, at first, nothing more than the post-convulsive exhaustion, often seen in epiloptics, in whom also the mystatic increase indicated by the knee-jerk and ankle-closes is often seen; but, eventually, the inco-ordination established, apart from defect of semution or putellar reaction, indicates a morbid change in some region of the cord, other than that of the posterior sensory roots, and this change is detected seron the columns of Gall, and partly in the past-commissival case, the implication of which andoubtedly leads to inco-ordinate action, without further derangement of rutaneous or miscular sensibility. fact, a martid hatis is established for the unscular excitability indicated by the increased knee-jark in a finely punctated sclerosis of the lateral columns of the cord, which may be traced from the doreal sord throughout the lumbar region, but it may not be at all apparent in the cervical region. (Pf. xv.) It is to the increase of this sciences. state of these columns we must attribute the progressive stiffening of the lower limbs, and their exalted muscular oritability. Later on in the history of these cases, the changes noticed in the columns of Gell spread obliquely outwards so as to directly involve the posterior sensory root-fibres, induring thereby the notable stary and ansothesis of the limbs; but still exhibiting betwixt lower and upper limbs, the contract of rigidity of the former (associated with no special wasting) and of extreme atrophy, paresis and flaccidity of the latter. As regards the arms, the changes found in the anterior cornus suffice to indicate the cause of extreme emaciation of certain nuncular groupings, and their progressive cafeeblement in notor power. (Pl. xxi.) The lexions in the multipolar cells of the cornus also, in like manner, explain the complete flaccidity of this member, for in this region the lateral columns are not diseased. Charcot's riew of anyotrophic lateral scierosis cannot be advanced here; for we plainly see a degenerative atrophy of the cornual elements at a plane considerably higher than any change indicated in the lateral rolumns of the cord; the latter, in fact, is first som in the dorsi-lambar region, use in the cervical, whereas the degeneration of the auterior cornus is tiest seen in the cervical region. That the latter is established by a cort of projection of the disease forwards from the lateral columns is, therefore, here quite untenable, nor, in fact, can any relationship betwist the two be affirmed; and this accords completely with what we constantly see in ordinary descending lateral addressis from focal cerebral lesion, where the lateral columns may remain for eight or ten or more years profoundly implicated, with no obvious change in the cornus. Evidently, then, this disease in the anterior cornus of the cervical and the lateral scherosis of lower regions of the cord are independent states, australly related only as regards a community of origin higher up in the cerebral certex. Why it is that the cerema are affected in the cervical, and the lateral columns in the deeslumbar cord, can probably be explained only by the special localisation and depth of lesion, or degenerative change within the cerebral certex.

Then again, as regards the posterior columns of the cord; we find here the frequent vascular change observed in general paralysis, and the affections whereby the cortical lesions tend to project their influence upon subordinate regions of the spinal axis; the vascular targescence, however, is not so great in these cases as the purely neural change. (Pl. xxiv., §9.3.) The shange is not one of connective proliferation, of abundant cell-growth of scavenger-elements, or of notably-enlarged vessels presenting changes in their tunins; it is not a vascular nor interstitial connection, but a purely neural change—a genuine asyelitis—tending to ajread exclusively along the direction of the sensory reconfibres, as indicated in the description above given. No cases, in fact, would better indicate to us the neural origin of ascending changes in general paralysis, and in certain forms of rades.

If, as often happens, the posterior comms to also implicated by extension of this lesion to the substratio geletimose, we get anenthesis of the corresponding limb.

The order of evolution of the morbid changes, appears to be an follows—first, the posterior median and posterior commissural names are involved, issuing in inco-ordinate gait; next, the lesion tends to spread over the whole of the posterior root-zone, and along the course of its sensory fibres; at the same time progressive degenerative changes occur in the lateral columns in the domi-lumbar region. Exchanges occur in the lateral columns in the domi-lumbar region. Exchange botter changes are much advanced, amyotrophic change is observed in the upper extremities, revealing the lesion located in the anterior cornua, and, subsequent to this, a rapid ascending change from this site implicates the bulbar nerve-nuclei, and hastens on the fatal termination.

Implication of Posterior Columns (Pseudo-tabetic forms)—
We have thus, so far, dealt with a combined system-affection of the
cord in general paralysis, where a postero-lateral change predominates
in the lower region, and a polar impairment (insuing in progressive
general muscular and balbar atrophy) is emplosised in the ceretral
regions. Let us now consider, more particularly, the cases where the
former suchusively exists. A notable feature in this class of cases in
the predominance of sensorial derangements, not as regards spiral
symptoms only, but as expressed in cerebral symptoms also. The
mental anomalies appear specially to indicate a wide-spread sensorial
implication, and the maniscal persensions are characterized by most

virid acute ballacinations, by very painful emotional states, often culminating in attacks of the most scote melancholia. The painful mental states are all associated with well-marked hysterio outbursts so characteristic of this series of cases. It is only in the later stages of the discuss, when the dementia is far advanced, that this painful state of mind declines, or rather in replaced by a condition bordering upon adverse, often with much frentied excitement.

Another prominent symptom is that of frequent convulsive attacks. which are often possibility severe in nature, and leave wide-spread and netable sequelat, physical and mental. When such a case presents itself, we are struck at the onset by the marked tabetic gait, a feature especially atriking if the subject be in a state of excitoment. The feet are planted wide apart, the legs thrown out in most disorderly style, and the heel brought down with disproportionate force. The incoordination is further increased by closing the eyes, and the patient cannot stand in this position without falling. Yet, muscular power is in no way accountrily impaired, and the limbs will resist forcibly efforts to extend them. Since, however, convalsions are very frequent in such cases, we often find a considerable amount of paresis, but this only of a Wannient nature at first; great fatigue upon alight exertion may be complained of, or the grasping power diminished, as in one of our cases, to 4 kilogrammen. No permanent paralysis is detected in this early stage; but the all-important fact to recognize is the complete absence of muscular atrophy, and the non-implication of the cutaneous and muscular nerves. Yet, simultaneously with this absence of sensory manifestation in lower planes, we may find the sensory tract of the tripminus implicated-e.g., herpetic eruptions and trophic impairment of porner.

The staxic gait is, as usual, a more obtrusive symptom than the same impairment in the movements in the hand and arm; yet an altempt to write, to bettom the cost, to sew, or thread a needle at once makes evident the fact that the inco-ordination of the hands is as gravely impoired as that of the lower extremities. If convulsions occur, they are usually unilateral, or much more marked on one side than the other; they generally leave behind them a hemiplegic state, often with complete hemiannesthesis. The reductions from such convulsive sciences are often most profound and prolonged, the subjects being left for days together in a state of complete stupor; mute, requiring forcible feeding and catheterism, and keeping the mouth full of salivs. Then, as normal sensation in regained and muscular power returns, we may have wild delirious excitement, which may be associated with desperate suicidal impellers.

Repeated attacks of homiplegia with more or less complete anna-

thesia of the same side occur, leaving the patient speechless and helpless for days, until even mally the aspect of the case is one of atter imbecility. In the intervals, however, between such seleures, he may still go about exhibiting notably the inco-ordinate guit, but with normal, or more often with acutely-engagerated knee-jeek. Contractions of the limbs now eners, generally limited to the upper extremities, and corresponding to the side usually left paralysed after convulsive seizures; thus, in a case of right hemiplegis with hemianauthesia following convulsive attacks, the permanent paralysis and contracture is sure to develop on this same side. Ushered in by slight initial rigidity of the extensors of the forearm and wrist (which permit of wrist- and ankle-clonos upon slight flexion), the flexors soon antagonise and contract the arm in the usual semiflexed and promoted position. In this advanced stage there may still be no vasouster change in the limb, and no indication whatever of trophic disturbance; but at a still later stage the skin of the feet may be cold and bloish, and a co-existent anosthesia may be noted in the skin of the calves, the plantar refexes, however, still remaining brisk. The lower extremities may show a certain degree of clasp-knife rigidity, or spasmodic fixation, but no permanent contracture; yet, in the latest stage, the repeated convulsive seigures so far exhaust the energy of the motor tract, that the patient sits equatting in stooping posture, or attempts becometion on hands and knees. Deglutition may be little impaired except as the immediate result of epileptiform seizures; grinding of the teeth is a very frequent accompaniment.

From the first series these cases are, of course, natably distinguished at the outset, by the far greater obtrasiveness of inco-ordination. which, at first eight typically taketie, is subsequently found wanting in that implication of the sensory nerveroots which would render it a genuine tahetic condition. No disturbance of muscular or cutansons sensibility, however, is discoverable, except as the immediate outcome of a cerebral discharge. Such cases conclusively prove that incoordination may result from lesions in the regions of the posterior columns other than the posterior root cone; and that the posterior rootfibres must be implicated to explain any existing sensory anomalies of skin and muscles. We find in the cases presented by this series that the posterior root-zone is absolutely tree from disease; and that any mortid implication of the posterior columns of the cord is exclumely limited to the posterior commissural sone and posterior-median columns (columns of Goll), in cervical, dorsal, and lumbur divinious of the cord; this implication of the columns of Goll with a perfectly healthy state of the sensory root-fibres we have repeatedly recognised.* The lesion

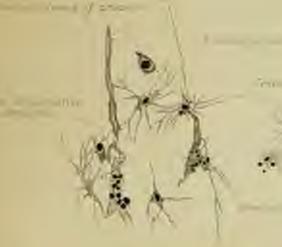
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observed differs also from that of the former series in being a much more pronounced vaccular and cellular change. The vessels of the posterior commissural sone being notably dilated, and extending down the median raphe, are accompanied by a donne crowding of scavenger-cells. (the abundant preliferation of which is a striking feature) presenting a course trabecular appearance, in which thick walled vessels with contracted lower are freely scattered. (M. xxiv., Sy. 3) M. xxvi). The nervedibre does not itself appear implirated as in the former series. and the disturbances in its conductibility are probably the result of the pressure produced by this morbid cellular growth, and the engarged and distended nutrient vessels of this region. The morbid change in tissue follows out very accurately the immediate confines of Goll along the inner half of the wedge-shaped spex, where it lies in contact with the columns of Burdsch, respecting rigidly the posturior root-cone, however; but, the columns are throughout their inner half the site of such change, especially along the median raphi-It would appear highly probable that, in these cases where inco-ordination, existing notably for a time only, has gradually declined or wholly disappeared, the phenomena may be regarded as present results which have not proceeded to actual assolitis, and in which the scavenger-cells have performed their deparative functions (p. 497) and have been replaced by fibrillated tissue. The separatur tone in all these cases in but slightly, if at all, impaired; and the anterior corner remain intact, as evidenced by the well-sourished aspect of the unuscles late on in the disease; no centric strophy of the limbs is seen as in the former cases. The general mescular debility and fatigue upon slight exertion, which anch cases present, are the outcome of the exhaustive convulsive seizures to which they are so subject, and not of a pensistent paralysis or atrophic change in the muscles of the linds. The descending changes in the lateral columns always appear as the sequel of the convulsive setrures above alluded to, and explain the association of exaggerated knee jerk with the inco-ordinate movements of the limbs; such selecous change implicates, as before stated, the greater part of the column, respecting, however, the direct cordellar and intersentio-lateral none, it yet creeps forward as far as the postero-external group of cells in the anterior corns. The change occurring in the posterior median tracts of the cord is earlier in its incidence than this lateral aderusis, as shown by the much larger development of contractures in the limbafter a long persistence of inco-ordination. Then we have to consider the association of the certical implication with these spinal changes. It is in such cases we get little, if any, indication of adherent membranes, and the strophic state of cortex will be chiefly located in the upper parietal or postero-parietal lobule. We have cleawhere indicated the association of lexions at this site with tremalous and

ataxic movements of the lower limbs," and it appears to the writer probable, that the implication of the posterior columns of the cord, at the side named, has some direct originating connection with the extreme atrophy undergone in the postero-parietal lobule.

The absence of muscular atrophy, which characterized the former series of cases, is commutent with the immunity of the anterior comma

from morbid change.

Waiving for a time any consideration of a presumed identity in such apparently different neuroses as asks and general perulusir, if the question be put as to the frequency of association of the two affections so named, the reply would possibly be in favour of a very infrequent alliance as observed in saylum practice. Nor would this opinion be surprising if we remember that the most obstructe symptom associated with rober is one by no means essential to the diseased process which is at the root of the ailmost. Inco-ordination -- so prominent a feature in all marked cases of tabes dorsalls need not he present to constitute this disease; and, if ataxic symptoms see considered as essential features in sales, then the incidence of such as affection during the evolution of general paralysis would very justly be regarded as most infrequent.

If however, we affect strictly to what is accepted as the patholegical definition of tolor, viz., an affection of the posterior nerve-roots or the peripheral sensory nerves, and accept he its essential clinical feature the abolition of knee-jerk, then we do find evidence in favour of a very frequent association between these affections.

There is substantial evidence (noth clinical and pathological) in favour of this severance of ataxic symptoms from the truly tabetic sign-loss of knee jerk; and the position assumed by Dr. Gowers in favour of such severance appears to us unassailable. There is undoubtedly an atasic paraplegia without the knee-tendon accompaniments of tales, there are, moreover, forms of indubitable tabes which exhibitno inco-ordination. On the other hand, we have repeatedly verified these data upon pathological grounds, and recognise besions of a special region of the posterior columns not implicating the posterior nerverosts as the essential condition associated with incoordinate movements of the limbs, the knee-jerk being normal or exaggerated; whilstimplication of the posterior nerve-roots was invariably associated with the abelition of that reflex phenomenon. Hence, a fallacy is likely to occur in our estimate of the frequency of association of those twocarebro-spinal neuroses; just as in the ordinary form of rabor the loss of the knee jerk is a symptom which may precede the more obtrusive evidence of the disease by many years, being a symptom which is apt

^{4 &}quot; Limitarion in Corebral Disease," Stat. Med. Journ., vol. it., 1982.

to escape detection. It m, indeed, generally revealed at an early date, not from the prominence of any motor inco-ordination, but from the lancinating pains with which it is so frequently associated. Taken, therefore, in this strict sense of the term, occurs in fully 15.9 per cent, of general paralytics (see Analysis, p. 320), a fairly large proportion; and such cases exhibit certain features which justify as in separately considering the class.*

It is not, however, with these more frequent forms that we are now more immediately concerned, but with the far less frequent association of energy today with general paralysis.

Implication of Posterior Columns (Ataxic Tabes).—This rare form of disease claims our closest attention, not alone from the acuteness of the neuroses, and the wide sweep of the nerve-storm ever the most distant regions of the nervous system, but more especially from the emphatic testimony hours by its clinical history to the close alliance (if not identity) of the morbid processes underlying ories derends and general paralysis.

The artack is notally unhered in he corebral symptoms which may be purely mental, and of the nature of a maniscal se melancholic outburst; or an apoplectiform or convulsive seizure may occur, such as not infrequently present themselves about the sesset of general paralysis, When seemed apaptoms preforminate they have usually been of an acute sharacter, tending to melanekolic agitation with impulses to suicide or daugenous aggreent ve violence. We have not observed the wild delirious state seen in the ataxic paraplegia last described. If congestive or convulsive seizures wher in the affection, there may supervene a transient homiplegia, more or less complete; and, probably as a sequelto this, we first prouguise the inco-ordinate movement of the limbs. We are not in a position to state when the knew-jerk declines, from the fact that these subjects come before our notice for their mental infirmity; certain it is, however, that it was lost in all the cases which presented themselves; whether such loss occurred (as in quite possible) before prominent corebral disturbances existed, or not, is a subject deserving further inquiry. A notable symptom in all these tabetic general paralytics is a severe frontal headache, often complained of to the exclusion of all other symptoms.

The mental state is possible in the fact that it is wanting in the redundant flow of spirits exhibited by typical paralytics, even where the most grandices notions prevail. The emotional states associated with ideas of extraordinary wealth, unusual attainments, or wondrous capacities for action, even if they do prevail, are tinetured by considerable discontent, querulements, and evidence of a general moral

[&]quot;The analysis, necesser, indicates, if we include uses where the refex is not completely abolished, the still higher properties of 204 per cent.

decadence. The subject may be distrustful, cunning, treacherous, and exhibit sullen gloom and despandency, or even herhous suicidal tendencies. Dementia may not obtrude itself on our source until the corebro-spinal effection is far advanced; and it must be afferned that cerebral symptoms may entirely fail to manifest themselves, and the patient be sent from under asslum supervision, but suffering from pronounced ataxy of the limbs, and other symptoms of takes dozzalis.

The bulbar symptoms of general paralesis are not necessarily a prominent feature; the pupils may be anequal, and respond sluggishly or act at all to light; the tongue and facial muscles may be somewhat tremulous, but the articulation is often clear and distinct.

On the other hand, the spinal symptoms will be stelking features in the case , the patient plants his feet in the manner of the staxic upon a wide basis of support; when he approximates them, he aways considerably and tends to fall; if he closes his eyes, he must inevitably fall; he fails to walk backwards, and forward progression is accomplished by disorderly thrusts of the leg, first to one side and then to the other, the heels coming down with a forcible stamp. If he be placed upon his back, and be requested to resist extension of the limbs, he exhibits considerable muscular power, and the grasp of the hand may be unimpaired. On percussing the patella-tendons the kurojerk is found ofseat, whilst the plantar and superficial reflexes may all be present. No annuthesia or other sensory defect may prevail. As in typically taletic cases, lightning-pains may still further cloud the poor victim's life, and be of so agonising a nature as to reader sleep futile, and necessitate frequent recourse to morphia. In all cases it appeared to us that a connection could always be established between the more scute cerebral and spinal exacerbations. The ataxy, in such cases as we describe, is more frequently emphasised in both upper and lower extremities; in uncomplicated takes it is the legs which chiefly suffer, and the arms may, as we know, escape. The atasy, however, is a symptom which varies in degree from time to time, and is includitably scarse with coincident mental exacerbations; the truly teletic symptom-abolished knon-jerk-however, is permittent, never being regained. We have known an instance in which both extretoities were thus ataxic; notwithstanding the patient was able to write a fairly intelligible letter, although with considerable painful effort and exhaustion. This was the case in the subject detailed by my colleague, Dr. Bullen," where the patient, tortured by debusious of persocution, quest many hours at the atcrifice of much discomfert in writing down his merked experiences and recording his accusations against his imaginary enemies. In this case muscular sense was so

^{· &}quot;A case of Locumeter Alaxy followed by General Paralysis of the Jasses." Arrain, April, 1988.

far defective that he could not tench the tip of his nose with the finger, when the eyes were closed, after repeated trials, nor approximate the tips of the fingers of both hands. It would appear also from the history of this case that the arms were first affected (the reverse of what is usual), since slovenly writing first drew attention to the fact of manual inco-refination.

The pains vary much in character and distribution, they are usually sudden, sharp, and lancinating, described as like electricity pussing through a limb; they may be described as tearing, agentising pains of moneratory duration only, or as "flashing pains" as one patient described them; or, again, there may be an intense burning pain over a localised spot, as the knee or foot, and accessonal "girdle pains" supervene. Rheumatedd pains are almost always complained of and the patient will, at times, speak of a spasmodic jerk of the whole arm, die (as he says) to the pain; or from the same came the leg may suddenly give way beneath him, and he drops on his knees momentarily powerless. Thus, in Dr. Bullen's case "there was momentary loss of power in right leg, with dimness of vision and confusion occasionally," also "byperesthesia over the area of Wrisberg," * Priantem and nocturnal sessinal emissions occur at an early stage of the affection of the cord, and sexual proclivities are engendered at this period, often colouring the delasional concepts of the autipot, his conversation and bearing being suggestive of satyriasis. Impotency follows, and, as indicated by Dr. Gowers, usually when the crossasteric and abdustinal referes fail to respect to normal stimuli. Hysteric symptoms often supplement the mental derangements, and a species of imane or hysteric canning is a prominent feature. In these hysteric outbursts we have seen one patient monels his wife with the most cowardly and uncalled-for violence; others, who have plotted degterously and with curning persistence and mendacity to damage the reputation of the nurse or attendant administering to their wants and others, who have been most foul and obscene in their language. This association of hysteric states in the tubetic general paralytic should be remembered since they are upt also to simulate symptoms and to deceive groundy, if too much reliance be placed upon subjective indications.

Delayed conduction along the souncey strands is known to be of frequent occurrence in talectic subjects at a certain stage; this we have witnessed in a toletic general paralytic to the extent of tooles seconds, which clapsed betwint pricking the sale of the foot and the registering of the semustion felt.

Gastric, laryngeal, and rectal stures have all been recognised in this accuratic condition, and are so severe at times as to render the patient

desperately and determinedly suicidal. In connection with such crises Campbell's statement is of great interest—" In all my cases the prot-mognetic nerves were extensively and strikingly diseased, more so than any of the peripheral nerves, and decidedly more than any cranial nerve. My observations in this connection entirely agree with those recently made by Colella (for cit.) and, in my opinion, it is impossible to attach too much importance to the remarkable singling out of the vagi for such extreme degenerations in this disease."

Tabetic General Paralysis. - To proceed to the more frequent clam of tabotic cases in general paralysis where abolished knee-lork has been detected, but where every is absent or plays quite a subordinate part in the symptomatic role, we find that a striking feature in the mental disturbance is the almost universal prevalence of melanchalic depression, the dejected, hopeless aspect of the patient notably contracting with the beaming expression of the typical paralytic. hasis for such depression is usually found in a persistent and torsienting sense-hallucination, to which they are peops, and which is not unusually of a sexual nature. One case long observed by us was subject to the persecution of a woman's voice from the neighbouring town, which insurted him whenever be went out of stors, and which prompted him to marry ber; the hallacination co-existed even with intense deprension and neisy weeping. It is in these hallucinatory states we find an explanation for another frequent association, that of sujeddal foelings which peculiarly characterise this class of cases. Almost all such cases have made determined attempts to take their own life by drowning, hanging, strangling, or like desperate means. prior to their admission to an asylum; and their subsequent history is only too confirmatory of this dangerous impulsive tendency. elementia, however, advances, the more acute metancholy assually declines and is replaced by sullen gloom varied by fitful periods of cheerfulness, in which we perceive the characteristic features of general paralysis-the egoistic state and optimism; the delirious agitation of the purely atazic forms we do not observe in such putients. Occasionally, but rarely, optimism may be from the oaset a prominent feature; there is in such a case advanced dementia. Thus one subject ramified continuously upon his "thousands of chaupague, hundreds of thousands of cigars, and his five husdred sons and daughters." The aspect of the patient corresponds to the mental state; it is usually one of gloomy dejection or quesulous discontent, in which the excuous expression of dementia is apparent; the brow is often corrugated from the persistent frontal headache so frequent here, and the hair is often rabbed off the frontal region, or off the whole of one side of the head, by the patient's hands; the skin is swarthy ar earthy in tint; there is always a notable degree of ntonicity in the facial muscles, and, indeed, throughout the musculature of the limbs. Upon the least excitement tremors of the facial muscles are induced, but no twitching; the lips participate in the same unatendiness, and the tongue exhibits a fine fiteillar tremor; speech is impaired, articulation being aloved, or blurred and thick, or a little quivering; it is never explosive. The oculometer symptoms characteristic of general paralysis were present in all the cases observed by as.

PATHOLOGY OF EPILEPSY.

Contents - Modern Virm of its Nature - An Impalpable Trophic Change - Objections to Methods of Enamination - Change in Elements of the Second Cortical Layer - Fatty Change in Nuclei of Nerve-cell - Common also to Alcoholic Instity-Vacualation of Nucleus - Ultimate Ereals flows of Nerve-cell - Implication of Motor-cells - Absence of Vacualar Implication - Functional Endowments of Nucleus - Resistance of Cell to Discharge - Nutritional Rhythm - Significance of time of Cell and Nucleus - Primitive Type of Nerve-cell - Degraded Type of Nerve-cell - Cell conformation as infiniteer of a Convulsive Countitation.

The morbid histology of opilepsy is confessedly an obscure question if we confine our attention to those seigeres in which coarse braindisease and maked-eye changes are not appreciable. Upon this point we have the authority of Dr. Gowers to the effect that there is little likelihood at present of our knowledge of its pathological nature becoming more definite, and that-" The changes in the nerve-centres are probably of that fine kind which is revealed only by altered fenction, and clude the most minute research." There exists a wideseread community of opinion that the pathological anatomy of epilepas, whatever it be, is the exposurion of a grave natritional disturbance of cell-protoplass, a nutritive disturbance which need not express itself in palpable morbid change even to the higher powers of the microscope. From this opinion, however, we must dissent; for it appears to us that a morbid appearance of the certical cell does wise of a highly-characteristic nature, when the cortex is the subject of careful examination by the fresh sections of research.

Nor does it appear arrange that the merbid change alluded to has been overlooked, since the astal methods of preparation are often the least adapted for revealing it; the chrone salts subjecting the cell to very important alterations which obscure the actual state. In the first place, the nervous elements of the cortex involved are the smallest met with; and, in themselves, are not the most clearly demonstrable in a state of health. Again, attention is likely to be distracted by the less important changes in cells of greater magnitude, where morbid appearances are more prenounced features. In the next place, the tissue-staining is fiable to obscure the early appearance of disease saless cautiously performed, and more especially the employment of eamle acid of too high a percentage, or for too prolonged an action.

The change in the cell alluded to is not peculiar to egilepsy; it accurs in other diseases, and especially sleokolic brain-disease, but never to so marked a degree and limited to such special cortical areas as in epileptic insanity. The nervo-elements are not the only ones to present morbid implication, for the connective-element or neuroglis is, as long known, invariably in excess of the normal. To describe the never boton first. The small irregularly-shaped neeve cells, occupying the position of the second layer of the cortex, exhibit a degenerative change which is so far peculiar that the nucleus of the cell is the earliest portion affected, the cell-protoplasm being apparently secondarily involved. The centre of the nucleus is accepted by an extremely bright, highly-refractile, spherical body-obviously of a fotty sware. If the cell be stained by the amiliae blue-black the mortid body appears as an unstained bright, spherical head in the centre of the deep blue black nucleus; the cell-protoplasm around being in its place differentiated by its lighter staining. In many of the surrounding cells no further change may be observed; but, closer observation shows that either the refractile body has increased so as to occupy the whole available space in the nucleus, the boundaries of which are still mapped out by a deep-stained circle, or that two or more of such bright refractile bodies present themselves within the nucleus, or that the nucleus itself is no longer apparent within the cell, the highly refractile body (in size and outline like the nucleus) being its pressured representative (Pl. six., B).

Although the more usual aspect presented is that of a bright spherical droplet of oil, it is by no means invariably spherical, but may assume a crescentic, obling, or irregular content. Minute as these nervo-cells are, the strong contrast established betwice the bright justrous centre and the sleep blue-black amilies stain of the surrounding nucleus, renders the change so distinct that, when once the attention is directed to it, a 1-inch objective suffices to reveal it readily as a wide-spread change in the series of the second certical layer of colls. It is not here assumed that cells in other layers wholly escape a similar implication, but that, whilst such a nuclear change may be detected here and there in the small soil large pyramidal cells of the succeeding layer, it is not an exceptional, but a most frequent, or universal, change in the second layer of the cortex; often every cell within a large field still retaining its nucleus, is seen flashed within by this bright morbid spectrum (Pl. xix., B). When the change has progressed so far that one-half of the nucleus is occupied by the muchid

substance, the former appears to have lost its selective capacity for the aniline reagent, stains poorly, and is but faintly differentiated from the enclosing cell; and, as the faity change processls, any remaining nuclear mass presents such a delicate stippled abading that it fades off into the cell-protoplasm, and is with difficulty distinguished therefrom, or is wholly lost to view. It is interesting to observe the persistence shown by the nerve-cell despite the degenerative change in its nucleus, and it is only later on in the stage of dissolution that the cell-protoplasm betrays evidence of degeneration. That the cells ultimately break-down is sufficiently evidenced by the pancity of elements in this layer contrasted with what is even in the healthy brain, and by the abundance of fragmentacy residue left by the process of disintegration at this level of the cortex.

The more advanced stage of this fatty nuclear change reveals a vacuolated condition of the cell, which becomes even a more striking feature than the simple fatty change. This vacuolation is evidently attributable to the bursting out from the cell of the globular head of fatty substance, leaving the cavity containing it as a very conspicuous object of sharp-cut marginal contour. Usually the cell maintains its original contour, whilst a large cavity occupies its centre, as large as is consistent with the capacity of the cell, so that a perfectly suberical outline is maintained within an angular or pyramidal boundary, the morest rim of stained protoplasm (thickest where the processes emerge) bounding this cortical vacuale (Pl. xx.). At times the escape of these contents involves a large margin of the cell, rupturing and destroying its lateral, or its basal, puriphery ; still the remaining protoplasm elsewhere maintains a rigid skeleton of the original cell, as that little real distortion of the less affected portion of the cell exists. The evidence of morbid change in the surrounding protopison of the cell exists not only in the rigid retention of the form of the enclosed cavity, but also in the presence of pale spots indicating the degeneration of its mass, which are, however, of far less lustrous aspect than the nuclear contents. Scattered amongst the less-discused cells of this layer we find angular fragments of destroyed nervo-elements, or sheaves of apical processes completely dissevered from any relict of cellular structure. This extreme degree of change, now described as racuolation of the cell, may occupy the whole of the second layer of the coetex; but, in certain cases, it has been found to affect every layer down to the spinstle series of cells inclusive. When the larger cells are the subject of this change, the cell-protoplasm presents apprepated globules of morbid material, obscured by the sleeper staining of healthier protoplesm; yet, pale by contrast, it gives the cell a perchar regred mulberry-like aspect.

The large "ganglionic" cells suffer very unequally in different sale.

jects and at different sites. In early stages of implication they appear swoilen, and take up an intense staining of their protoplasm, so as to obscure their contents in aniline bloe-black preparations. Such cells, in mounted preparations present an unusual relief, with clearcut contains, very unlike the same cell in a further advanced stage of degeneration, and are much more sharply defined in this state than in health (Pl. ux., deeper layer). Pigmentary degeneration of a limited portion of the coll may be seen, whilst in the darkly stained protoplasm three or four paler spots are seen, somewhat refeartile and gleaming through the superimposed protopleson. Many of such large cells are swollen and globose, maintain their lateral and basal processes, but have no spiral process, or merely a stanted one attacked; they are uniformly stained of a pale tint throughout, the nucleus having disappeared. When still further degenerated these cells present a blurred outline, as if from fatty biquefaction of their contents; or an extremely faint ghost-like representative of the cell alone remains.

With this fatty, nuclear change and vacualation of the cells of the superficial cortical layer, we observe no associated vascular change the results may be somewhat course, and distended more than usual, but no extreme alteration is observable in the tunies of the vessel, of course excepting such as may be attributable to other agencies, such as the senile or alcoholic degenerations, or the complication of subercle or of apphilis. Nuclear proliferation along the adventitis is rarely seen in epileptic insanity. In like manner, we do not most with the presence of spider-colls, which permeate the cortex and modulla where vascular lesions affecting the blood and lymph-channels prevail. Thus, in the morbid anatomy of epileptic insanity we find a special freedom from unclear proliferation, from tascular degeneration, and from hypertrophic states of the lymph-connective system, which obtrude themselves in alcoholic cases and in the subjects of general paralysis.

Pathology.—The essential nature of epilepsy is that of an abnormal discharge of nerve-force from the higher cerebral centres in the cortex, an "occasional, sudden, rapid, and excessive discharge" (Dr. Bughlinge Jackson). It matters not, for the essential character of this affection, whether the phenomena are sensorial almost exclusively or untorial, whether the aphere of mind is specially involved, or whether there is the failest development of the epileptic spaces; the essence of the disease consists in this excessive food discharge." A matritive irritability underlies the morbid activity, and invariably expresses itself in stone one or other morbid charge recognisable in the structural elements of the cortex. As we have seen in each cases of epilepsy,

^{*} On the origin, executed nature, and conditioning factors of the nervous discharge too a masterly study in the Charles Memor's work. The Mercuscipation and the Mind.

where mental disturbance predominates and actual insonity co-exists, we have a notable affection of a special series of cells, not exclusively seen, however, in this disease, for it likewise prevails in other convaluive affections, such as elemnic alcoholism wherein spasmodic discharges of nervo-energy are frequent.

The extensive nuclear degenerations which we have described must issue in the death of the cell. We know little, for certainty, as to the functional embowments of the nuclous, but we may recognise its presence in all conditions of active growth and functional life in the cell, whether it be a perce-cell or element of other tissues, including the phenomena of karyokinesis. With its atroubs and disappearance we find associated declining functional activity and ultimate degeneration of the cellitself. We have seen elsewhere that there is much reusen for regarding the cells which prevail in this layer of the cortex, as pertaining to the sourcey type of nerve element, and that a functional connection subsists betwist them and the large motor elements distributed at a lower level; in fact we may, perhaps, regard those individual layers as constituting a highly-complex neasony-motor are, of which they are the respective poles. What is the functional relationship existing between those elements ! That these presumed sensory units have an inhibitory control over the subjacent elements, and that, lacking such control, their discharge will be subjected to the periodicity of the nutritive rhythm is very probable. The changes presented by the cortical nerve-cells have long led us to regard the uncleus as auto-reing an important rife in the functional activity of the cell; that its displacements, distortion, degeneration, enforbled vitality," and its alsence are constant accompanies at cerebral disturbances characterized by loss of inhibitory control.

From this point of view, we have been accustomed to regard the proportionate size of nucleus to nerve-cell as indicative of the inhibitory controlling capacity of the cell in question—its own resistance to discharge. Hence, these minute elements with large nuclei in the second layer would possess a far higher degree of resistance to nervous discharge than those of lower levels, in which the nucleus bears a far smaller satio to the surrounding cell-mass. Thus in these higher levels nerve-discharge would be impeded, and the cesistance and time-riement sharar-

^{*} As probably illustrated in its fooble simpling to result respends.

⁺ Nor is this supposition opposed to the results of Kassmand and Tenner open the effects of makkin has of large quantities of blood. Suddenly induced ascerns by withdrawing the requisite publishs would directly affect the undear course of scaling, which are reregained as actively operative in the anterior of the cell; the autodrawyl of such publishs would be exprovalent in a total arrest of such danction, in the virtual paralysis resulting in the clumbarge of some energy from the cell expressed, on the curried side in low of composition, and on the physical side is present computations.

teristic of the mental operations would some into play. Certain it is that in such cases where nuclear degeneration has proceeded far in this layer, there is a motor and mental initability characterised superiolly by periods of nutritional rhythm. In like manner, the cells of the motor area are propertionately large, and subserve the function of storage of motor energy; but these nucleus is small in proportion thereto, and their resistance to discharge consequently alight, their functional equilibrium is more readily affected; their greater mass requires augmented nutritive resources to reinstate them subsequent to their discharge (Ress)

It has already been indicated in discussing the etiological relationship of epilepsy that According plays a prominent role, and that epilepsy, direct or cellateral, occurs in a large proportion of cases; with these are associated ancestral intemperance, which likewise is an important factor. It becomes, therefore, a question worthy of consideration whether we have here to recognise in the structural modification of the cell the physical basis of such hereditary transmission; is it probable that the unclear and cellular change bears the imprint of ancestral Vice! That the inflated spheroidal cell of epileptic idiota is a distinct recersion (or, at least, an undeveloped stage) is doubtless true; not only does its confermation indicate its lowered type; its degenerated protoplasm a sustained nutritional anomaly; its paucity of branches a restricted relational element of cell-life; and its nuclear change in form and position some vital peculiarity inconsistent with the normal activity of the cell; but we also have evidence of reversion in its case, in the appearance of each cells (i.e., of inflated spheroidal elements with few processes) in some lower forms of life, and we have elsewhere indicated their existence as a normal element in the cortex of the ago. * We see no reason, therefore, for doubting that when such cells occur in the cortex of a class who also bear the history of ancestral view, such as spilepsy and drink, they are the expression of a reversion to a more primitive type so induced.

Here, however, we must distinguish betweet idiopathic opilepsy in the adult and those forms which are clearly due to gross central change, or such cases where epilepsy is but the accidental accompaniment of developmental arrest. The onset of epilepsy in early life is recognised as highly eminous to the mental well-teing, and it is undoubtedly an established fact that, although in adult life in exceptional cases, epileptic seizures may co-mist with great intellectual vigour, yet its occurrence during persods of active cerebral development in infancy and youth is attended by a protound change in each activities, and usually in their total arrest. This fact is often expressed in such terms as to imply apparently that the "fits"— i.e., the conventions

^{*} Truns. Boy. Sec., Sec. 10.

seizures themselves—are the agencies whereby the cerebral activities underlying mental evolution are injuriously affected. It must, however, he besse in mind that the convulsive discharge in itself is not the factor in the arrest, but simply betrays the nutritional impairment (in itself the origin of the convulsive discharge, and, at the same time, of arvested evolution). It is in the structural peculiarity of the cell that we must learn to recognise the origin of the convulsion, and of the stunted mental development which such vicious conformation symbolises.

On the other band, in forms of idiopathic epilepsy ariting autooquest to the attanuoust of adult life, the asers striking feature presented to our notice is the depondation of mind—its gradual elemental by progressive demontia. Are we prepared to recognize such distinction in the histological elements of the cortex! We think there can be but intile doubt that in the latter cases (demontia) we simply witness a degenerative affection of the serve-cell, which, sport from this, betrays oridence of a full developmental constitution. In the former (epileptic idiosy), however, we find an altered type of cell, a limitation of its connecting meshwork, and a confirmation so decided as to at once indicate the distinction. Yet, underlying both forms, we will recognise that dispurity between nucleus and protoplasm, and the displacement or degeneration of the former, which be as appears to bespeak a constitution constitution.

PATHOLOGY OF CHRONIC ALCOHOLISM.

Contents - Marled Changes in Cerebral Vessels Scavenger Cells in Outer Zone of Cortex Sciences of Order Zone-Junglood Fodies beauth Pin-Implication of Motor and Spindle-Cells-Significance of these Charges-Despot Layers more generally Invalved - Early Vancular Implication - Aneargsmal Balgings --Attercenation and Fatty Change Purmentary Deponcration of Motor Cells-Stayenger-Elements in Spinsle-Layer-Deponenties of Medulated Nerve-Fire Spiral Letters Vaccabetty Hypertraphy of Torica Manufacts as Inconstant Feature-Relationships to Chronic Bright's Disease-Sciencia of White Cultures of Cord-Spinal Degenerations to Typical Case-Implication of Clarke's Coloun-Immunity from Multiple Nouritie-Neurotic Bentage-Chrome Endartentie-Patty and Science Tendency-The Brain of the Criminal Class Econylineal Resemblance to General Paralpsia. Coincidence of Grandione State and Deleniors of Personalion-Incomstant Vertical Implication of Cord-Constitutional State that of Chronic English Disease-Encoptional Transition to General Paralysis-Significance of Arterial Changes-Affection of the Vinceral System.

The vessels dipping into the cortex from the pix are of unine size, course, frequently bectuous, and their costs are in advanced stages of atheromatous and fatty change. The nuclei of the adventitial shrath are comewhat numerous, are freely proliferating, or their protophum is

in a state of fatry disintegration (Pi axiv., figs. 1, 2.) For the more prominent feature, however, is the abundance of susceptivella which pervade the upper or sutermost region of the peripheral zone of the cortex lying immediately beneath the pia; these nucleated protoplasmic bodies are everywhere seen, their branching processes forming a deme uniting which converts the outermost fearth of this cortical layer into a closely-felted substance of minute meshes, the aspect of which differs strikingly from that normal to this region (Pi, avit., fig. 1). Wherever a blood reased passes downwards through the certical layers, these scavenger-cells are more numerous, following the line of vascular channelling, and so dipping down into the nerve-elements of the second layer. The appearance forcibly reminds one of the increase of connective passing along Gibson's capsule in a sciencial state of the liver.

This falted structure is always most dense immediately beneath the pia, where it is so far confeased as to take a deeper staining of the reagent quite recognisable to the naked eye. The depth of the whole peripheral zene is also perceptibly amin/shed, the outer fourth being distinctly impred-off from the rest by its deeper tinge. We meet with this development in different stages; constantly the cellular element productionates young starenger-colls are numerous, their fine extensions being widely scattered and sparse; in other cases the cells are found of larger size, forming plump, amorbeed elements, from which radiate processes pass into a fine moshwork around; still later, the protophismic masses have dwindled down or totally disappeared, leaving simply the dense, felted, fibrous structure profusely besprinkled with the still remaining unclei (Pl. xvit., fig. 1). Beneath the pia, betwist it and the surface of the cortex in the m-called spicecedral space, we often find a vast quantity of amyloid bodies, and the fact that these are abundantly recognisable in first actions from from beain is sufficient refutation of the assumption that such bodies are not of morbid nature, but artificial products of alcoholic reagents used in preparation. Here and there along the walls of a blood-vessel a little heap of proliferating nuclei is seen, from which fileous extensions pervade the cortex on all sides, giving the vessel a peculiar aginous dispect.

The perivascular space is also seen distended by ammerous lymphoid elements, and the nuclei of the sheath are often mapped-out by a linear series of oil globules which alone remain to represent the degenerated element. Critically examining the second and third layers of the cortex, we find no very pecusinent lesion—a few of the tower pyramidal cells may be degenerate—but, until we reach the fifth layer of motor cells, no very obvious change is apparent in most cases (Pt. xxiv., fig. 1). These large cells, however, are in an advanced stage of fatty change, and together with the layer of spinite-cells immediately beneath, are undergoing extensive disintegration and absorption (Pl. xxiv., 6g. 2). Can we explain this apparent anomaly of the escape of the superjocent layers of nerve-cells, and the extensive implication of the outermost and despect layers betwint which they lie? A special selection of seriain layers by the morbid process appears to be evident here, and may be a fact of great significance.

In the first place, we must call to mind the fact, that the outermost entited layer represents the spical distribution of the large, deep-seated cells which have been presumed to possess motor endowments; and that their poles, therefore, are (in the early stage of general paralysis, as well as in alcoholism) affected by the scierosic change proceeding in the outer layer of the cortex, and that these cells are, therefore, affected by a degenerative change ere the morbid process extends deeply into the small elements of the second and third layers. But simultaneously with this an invasion of cortical-elements also takes place from below—i.s., from the modulla of the gyri, and this morbid process spreading spwards involves both spindle and motor elements successively.

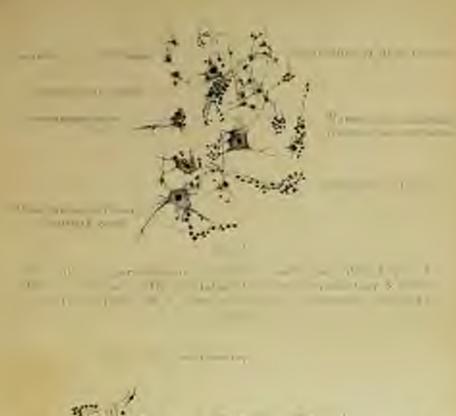
The cerebral certex presents, therefore, in such cases very notable morbid change; and one specially characterized by the greater concentration of the lexion in motor realms of the hemisphere, as well as by a supprehat definite restriction to certain layers of the cortex, to the exclusion, more or less, of the other layers. The deepest cortical layers are those more especially affected; cases being met with where the appearant layers show no morbid indications whatsoever.

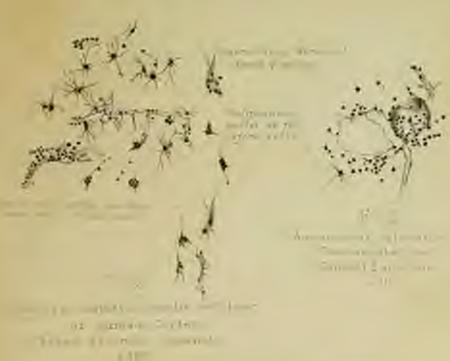
The vascular, nerrous, and connective elements all participate in the change, and it thus becomes of interest to learn which of these tissues is primarily involved and, therefore, plays the more important rile in establishing the pathogenesis of abronic alcoholo insasity. A careful study of a series of such cases would lead one to infer that the vascular is the first tissue involved in the morbid evolution. The leng, straight vessels of the cortex are peculiarly liable to these changes, and where they dip down deep into the spindle-series of cells, each results present gross lesions of their tissues, as also of the inmediate neighbourhood around.

The vessels themselves are enormously and unequally distensed, showing numerous ampulhe or ancury small distensions, usually funiform in character, their tunies crowded with nuclear proliferation. Carefully prepared sections of freezn cortex often appear riddled by a large number of circular holes, with sharp-cut edges, as if punched out of the brain-tissue, or by long fusiform channels, the site of diseased vessels

which may have dropped out; or still convey distended vestels, the walls of which are mottled by atheremateus change, whilst a poculiar alluminoid material (anatained by aniline) fills their cavity or is effered around their ruptured orifices. The nervous, as well as the connective, elements of the upper three or four layers of the costen may exhibit no morbid change, but at the site of the large, so called mater cells, constituting the clustered groups of the contral gyri, we discover a notable degeneration. These great nerve-elements are much swellen and rounded in contour, and, in lies of their usual extremely delicate protoplasm, present a rough granular aspect internally, which often takes an intense staining from antiline, leaving a perties, however, quite unaffected by the reagent and of a coursely granular and often yellowish has (Pl. axiv., fig. 1). Such cells are frequently seen deprived of their apical processes by a veritable degeneration. At its connection with the cell stielf this process may be greatly and irregularly swellen and pigmeated, beyond which a sudden attenuation occurs, and, after a slightly-contested course, it disappears entirely (see several instances in Pf. 851v., 89. 1). Another appearance universally presented by these degenerate cells is the abnormal, coursely-defined boundary wall of the cell, which, as we know, does not exist as a separate nonstituent in the normal cell of health, or, at all events, cannot be differentiated from the protoplasmir contents in fresh-prepared sections from frozen cortex. The formation of this cell wall, betwist which and the enclosed protoplasm a mass of pigment collects, the former shrinking as the latter corrosches upon the cell-contents, is a constant feature in all cases of alcoholic dependration of the cortex; it brings the cell into a peculiarly notable relief, which is observed in other degenerative affectisms of the cortex. Those large degenerate cells have usually several short, stanted, and swollen processes to which nuclei adhere. Times-fourths of their cavity may be occupied by coarse, granular, gotten pigment, and the mained protopiumie residue exhibit a few glistening refractile oil-globalm, or one large eircular cavity (vacuole), from which such oil-glabules have forced their way out, the protoplass in such a case not filling the vaccuum.

Itown in the lawest layer of the series—the spinile-cell formation—we come auddenly upon large developments of seavenger-cells, which above this level were not apparent. Such elements, characterised by their spider-like appearance, are scattered profisely upon the coarse blood-remels of this region (above referred to) and extend their ramifying processes in all directions around (PLxsiv., 6g. 2). The spinile-cells, moreover, are themselves covered by beaps of nuclear proliferations which often entirely conceal them from view, so that their position and course are usually supped-out and alone indicated by these little







nuclear accumulations. One is also struck by their greatly diminished number, and by their frequent pigmentary change where the rellcontents are visible. The conclusion forced upon us by the appearances presented is that they are undergoing rapid degeneration and removal through the agency of the aravenger-corpuscies, which, as previously explained, act in the capacity of "phagocytes," and devouthe nerve elements. In Pl. xxiv., Ag. 1, representing the large motor cells, we observe three large elements with transated imminite undergoing marked degeneration. Above, there is a similar cell, in which the greater part of the apocal process is pigmented yellow, whilst at its have a course years!, crowded with a heap of nuclei, is seen. Many small cells are also scattered about, covered with a rich nuclear proliferation. In fig. 2, which represents the same cortex but at a lower level, the spinished-il formation is seen, spiritely scattered with nuclei, has the site of a rich colony of mavenger-corposcles. paracity of the spindle cells, which, at this site, should be most abundant, is well seen in contrast with a section taken from sensory realism where scavenger-cells are not formed (to the right and below in fig. 2); the cells are not pigmented, but are covered with nuclei. The basal or exis-cylinder process of these large motor cells is a very persistent structure in most dependentive affections of the nerve-cell , and, as we have seen, whilst the spical process readily breaks down and degenerates at an early stage, we yet find that this axis-cylinder process persists. If, however, the modullated perve-tions passing up from the modullary corof the gyrus into these lower regions of the certex be examined, a very striking change is apparent. In fresh sections of healthy brain these fibres are not stained by the milline method; the medulisted sheath prevents the reagent gaining acress to the axis-cylinder. In certain degreesative conditions, however, a change occurs in the medallary. investment, probably of a fatty nature. The medalls is removed or greatly attenuated, so that the axis is exposed and stained roughly by this reagent, and then it is apparent that the axis-cylinder is itself greatly avoilen and often irregularly fusiform. The identical appearance is also observed in senile decay of the certex, and here often to a much more striking degree than in alcoholics. Upon the medullated investment, where it appears, spider cells are often seen abandantly ramifying. The medulla of the convolutions in cases of charmic alcoholism, therefore, presents very notable divergence from the normal appearance, which at once arrests the attention in preparations of fresh brain, statued by the aniline methods, the straight axis cylinders being prominent objects crowding the field in bundles which can be traced for great distances through the medulis.

On scanning the white matter, we are also strack by the large number of extremely course dilated vessels, which afford to evidence

also of grave structural change. These matrious twigs are not only generally dilated, but present along their course frequent furiform and usculated ansurismal distensions, often of large size, the costs of which are notably diseased. These apearismal one in many cases will have fallen out of the section, giving rise, as described in the cortex above, to clean-cet circular or fusiform opinings, which are often very numerous in such subjects. The ascendates dilutation is often the site of a large accomplation of hematoidine granules which crowd its interior, and are scattered profinely over its surface. Occasionally the seed is seen plugged (possibly by a fatty embolis); the proximal distended part may love ruptored, extraorasted blood and homatoriine crystals crowding the field around) or a more frequent appearance. (seen, in fact, universally over the feld) is the distended reased with the inless in a state of atheromatous and fatty change, and the rescirated element of the shouth also undergoing fatty distancements the walls covered with young spider-cells, and briefling with their processes on either side (FL xxiv., Ay. 2).

Large patches of fatty material containing oil-globules and granules are seen along the coats of the blood-vessels in fresh-stained stilline preparations. As unstained, colourless, and highly refractile spots, contrasting with the healthier and stained tunion around, such patches have a smallen, semi-opaque aspect. All the more degenerate notrient twice are the site of a rick colony of scarrages-cells in their various places of development and retrogression; such elements often look like simple nuclei, until, carefully focussed, their delicate protophanolomass and radiating processes are discerned. These convenger-elements are traced in great abundance throughout the white matter of the convolutions.

Plugged reacts also appear frequently, the tissue on either side being often deep stained and sclerous in character, and the axiscylinder in the neighbourhood unduly large and irregularly awallen. The medulla shows a patchy staining of its ground work to low powers, which on the use of higher objectives is resolved into light, unstained areas lasting few or no nuclei, and darker stained areas of a finepunctated aspect (the result of fibrillated spider-cells), amongst which are many nuclei.

Spinal Cord.—Throughout the whole extent of the spinal cord we find increased cascularity, or, at least, a more obtrusive presentation of vessels than is normally observed here. The vessels supplying the posterior columns are those most affected, those of the anterior columns least involved, whilst the lateral tracts suffer almost as frequently as the posterior. These natrient branches become prominent objects by reason of the great increase in the thickness of their walls—a feature which is exceptionally striking with respect to

the smaller vessels between 8 µ and 8 µ in dismeter, the open lumen of such divided vessels rarely being over one third or one-fourth the whole diameter; but vessels measuring, respectively, 18 µ and 36 µ norms also have not infrequently a lumon of but 5 µ to 10 µ. This increase in thickness is seen to be due entirely to their muscular cost, which in small vessels of 8 µ diameter will attain the thickness of 2 µ. The increase in the muscularis encroselves much upon the cavity of the vessel itself, and the non-elastic intima is consequently thrown into a plained form, or has a condensed deeply-stained appearance mapping it of from the tunion media; occasionally the vessel is scaladed by this increase in its nearcular tunio.

It is not all cases of alcoholism that exhibit this notable thickening of the unusualized; for in some we observe for less concentration of the classes upon the execular supply of the cord than upon the rescale of the corebral cortex. The following averages represent very conclusively the dimensions of the James relatively to those of the arterial tunies in cases where spiral symptoms were a notable feature as contrasted with those in which no special symptoms presented themselves:—

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The change in these yessels appears to be identical with that increase of the musers/aris which has now been long recognited in chronic Bright's disease, since its discovery by Dr. Geo. Johnston no notable fatty change implicates the serious, the vessels do not here, as elsewhere and in the brain, necessarily above atheromatous degeneration; nor does the adventitial sheath betray evidence of a reactive inflammatory condition. The immediate environment of the reasels shows, in most cases, a normal condition, beyond the prevalence here and there of amyloid bodies in juxtaposition to the vessel. Occasionally these bodies become very profinely mattered throughout the whole extent of the white columns of the cord, more especially around its periphery and following inwards the direction taken by its nutrient branches. In these latter cases we find, however, indications of an inflammatory change on chronic meaningitis; the pix being often greatly thickened, its vessels such distended, and its meshes containing leococytes and inflammatory products. The committee trabecular extending from the pix into the substance of the cord are extremely coarse, and a diffuse selerosis thus originating often affects all the

meduliated tracts of the spinal cord. Thus, the peripheral zone of the cord is especially implicated; and the sclerook tiscue follows more readily the course of the larger blood reasely, so that the median raphé of the posterior columns is a faccurite size of this scleenus change. which often extensis over the whole of the columns of Gall. The course deep channelling by blood-vessels, and the profusion of scavengercells, give to the posterior esisting a notably morbid aspect. In a typical case examined the autero-lateral columns were extensively implicated; the pia was greatly thickened; and a petrby diffuse sclerosis affected the anterior root-zone, and the lateral columns, together with its direct cerebellar tract. The various arguersts of the cord also showed much irregularity in distribution of the morbid change, and the non-systematic nature of the lesion was clearly demonstrated. The posterior nerve-roots, also, indicate a similar interstitial change; bondles of atrophied nerve-tubuli being own embedded in much deepstained connective-mans. Atrophic changes, also, had involved the coll-groupings of the anterior cornu; and the postero-lateral group in the certical region on one side was notably affected, few cells remaining, and those degenerated as the result of the invasive scienesic tissue. The intermedic-lateral group was in the lower cervical; in a smiler state of degeneration on the side corresponding to marked scherosis of the lateral column.

The intermedio-lateral group of cells appears peculiarly prone to degeneration, and other cell-groupings-c.o., the anters lateral and the internal of the anterior horn on the same side are thus in like manner involved. Clarke's vesicular column is likewise sable to implication in these affections. Coronal changes are by no seesans infrequent, and are of special interest here in relation to the implication of special cell-groupings which are upt to present themselves. Thus, in the dorsal region, it is not unusual to find the cells of the intermedic lateral column of one side plump and healthy; those of the opposite side being atterly degenerated in the midst of a dense science. tissae the same unilateral lesion of Clarke's residedor colonia may also be abserved. In the former class of cases, the naked-eye appearance presents no almensality in sections across the cord, and it is only in the second series, where wish tracts of connective tralecula traverse the columns of medulla, that we appreciate morbid change, which is still more apparent when the stained section is cleared up and examined. That the posterior nerve roots do occusionally participate in the change has already been stated; but, that the spinal charges originate in the affection of the peripheral nerves is by no means probable; they must be regarded as colorident affections. Frequent as multiple neuritis in amongst chronic alcoholics of the femals sex, we do not recall nevcases occurring in alcoholic insunity. That it is occasionally men with





we do not doubt, although the percentage of immine females subject to chronic alcoholism is small, but we must be prepared to regard cases of chronic alcoholis immutity as presenting predispositions which more or less modify the tendency to peripheral implication of the nervoussystem. Whatever be the explanation of this pancity of cases of multiple alcoholic neuritis amongst the insure community, certain it is that alcohol in these predisposed subjects does tend to concentrate its operations chiefly upon the vascular membranes, first, of the besin and, next, of the spinal cord.

Pathology. The pathology of alcoholic insanity is but one chapter, though not the feast important, in a long history of retrogressive changes to which the whole organism is subjected through the prolonged operation of this agent. Through the medium of the bloodvascular system, alcohol, by its ready absorption and permeability, is rapidly conveyed to the most distant parts of the organism, establishing wide-opread constitutional disturbances; whilst through the penuliar selective capacity of the nervous centres for this poison it thereasen expends its primary and most potent influence. Although in all meet the norvous centres bear the chief brunt of its attack, it by no means follows that the subjects of chronic alcoholism suffer in the same way. In one, the gastric; in a second, the hepatic; in a third, the renal and cardiac symptoms may come to the front; whilst in others, the nervous centres express the special virulence of the agent in their direction. Undenboodly a neurotic heritage plays a forestest part in thus predisposing to more exclusive determination of the morbid agency. upon the higher nervous centres, just no those subjects predisposed to renal degeneration will, on the establishment of alcoholien, display the usual cardio vascular changes of chromic Bright's disease. Beyond the limits of simple functional hyperactivity of the nervous centres. induced by frequent indulgence in alcoholic drinks, its persistent use leads to organic charge, first expressed in the reast's wall by the direct irritating effect of the spirit on its tissue elements. A chronic informatory state leading to extensive atheronators and fatty degeneration of the intime is the first apparent effect, associated with which we find parallel changes undergone by the edventitial about in the increase and fatty degeneration of its elements. Fatientics are frequently established in the smaller cortical vessels during the progress of these changes, and the extensive dilatetion and ancerismal states described above are probably direct results of the diminished resistsince of the vessel, and paralysis of its muscular cost. An extensive enderterine of a most chronic and insidious character affects the ultimate terminal radicals of the cortex, and, with the per-existing change in the composition of the blood, leads to the devitalisation of the nervous tissues, undereining the autritional ambility of the nervo-

rells. The subsequent change in the interstitial tissue around, and the nervous elements themselves, apparently depends much upon the subject's prediaposition, which seems to be the chief determining factor in engendering the fatty or aderous change which characterises these two clauses of alcoholic subjects. In all alike, however, we find the tendency to a degradation of tions in the replacement of the normal elements by new connective growth; but in some we find a special tendency to extensive fatty change in the nervous centres, so that the parallel degeneration soon elarwhere, as in the fatty or the selectored liver, seems to be also reproduced here. It is probable that the fatty change is altogether a more mosts process, and the selectois the result of a seach abover and more gradual poisoning of the tinsues; the fatty change, mercover, is much more liable to be induced in the case of senile alcoholics. We may take it, that the changes observed in the cerebral meninges as well as in the soft investment of the cord, when affected, are undoelstedly indicative of a very chronic inflammatory action proceeding in the vessels of the membranes, and slowly involving the upper cortical strata; for thus only can we explain the frequent association of membranes opaque and thickened, and the permeation of the cortex along the vascular tracts by dense connective networks. Much of the opacity of these delicate membranes is undoubtedly the resulting change of years of excessive indulgence, for it is induced slowly in all cases of long-continued alcoholic indulgence, apart from the establishment of actual insanity; thus, in most criminals, who are notoriously addicted to drinking, we discover such opaque and thickened membranes, and this usually in the postero-parietal regions of the brain (Henry Clurks).

Coincident with this implication of the membranes, a similar change is found throughout the nutriout cupply of the meduliated substance of the convolution, which, as before stated, leads to important changes in the lowermost series of nerve-cells, the spendlelayer and the meduliated nerve-fibres themselves at this site. It is obvious, upon examining several cases, that the one site may be chiedy affected to the greater or less exclusion of the other, and that, thus, a sclerous change in the peripheral cone of the cortex may preponderate over any morted change at a greater depth, or that this desper implication may be the more expressed feature, the pinarmshield being free from notable opacity and thickening. It is more usual, however, to find both areas affected, and this to a profound degree. Certain cases of chronic alcoholism approach, as we bare seen, in their clinical features, the history of percent paralysis . and when we come to the morbid anatomy, we find the membranes of the brain often presenting similar appearances, both as regards naked. ere aspects and distribution of leavis. The vascular implication,

however, is far different, and cannot be readily confused. In the one (alcoholism) the mortful clumps is centred in the atheromatous state of the inner coat; the numerous belgings and fusiform dilatation being also highly characteristic of this chronic inflammatory implication. The outer or adventitial investment does not show the mornous nuclear proliferation which is so notable a feature in general paralysis (Pl. axis., fg. 3); although in degenerated vessels it will be the seat of a profusion of someoger-only which entangle its walls in their processes. In the other (general paralysis), as previously stated, the merbid change is concentrated in the adventitial aheath, and is a far more noute irritative process in the loose external tunic of the vessel, which explains the more rapid implication of the nervous structures lying immediately around by direct extension. It is on this limitation of the more gross change for a time to the inner namic of the Mood-cessels in chronic alcoholisms, that the slow (yet progressive) impairment of nutrition of the nervecontrol slepends, which so frequently layers in abouty enfeetdement of the mental faculties, akin to the advancing imbecility of semile atrophy, in which similar changes of the vessel's wall occur. It is, on the other hand, in the early implication and rapid spread of morbid artivity along the alterational famic of the receds that the more arute changes are induced in the nerve-cells of the cortex in the general paralytic. When, however, superadded to the intravascular lesions, we find selecton tissue permeating the peripheral cone of the cortex, we have an invasion of those most externally-disposed medallated Shees which are also involved in general paralysis (29, Kaili, Sy. 1), It is in such cases, yeshably, that the mental symptoms assimilate to those characteristic of general pandysis. The sclerous shrinking of the new connective formation around the extensions from the underfring ganglionic cells, results in a degeneration which is obtinuately transferred to those cells themselves, inducing the already-described signmentary and fatty degeneration preceding their absolute destruction and removal; but, this extensive strophy of these large elements of the cortex is coincident only with the most advanced forms of alcoholis dementic, the earlier stage of vascular impairment, and the growth of young somespectors in the peripheral room, ere the cells are themselves involved, being apparently associated with the numbral excitement and early delucional perversions of alcoholum. It is certainly a remarkable feature that in both affections we get a similar implication of the vascular channels of the pix ever the atmost identical motor realize of the cortex; that in both the same nervous elements are premarily involved; and that, clinically, thereare presented to as so sumy features in common between the race affections, that it often becomes a most point for diagnosis. This

peripheral implication of the cortex would appear to us to explain the granding faling, so frequently commingled with the delauters of persecution from which alcoholic subjects suffer; the notions of wealth, of landed postestions, of exalted social status, which we find so often anderlying deliminas of restricted liberty, or of malign influence brought to bear upon them. When, however, the motor cell and axis-cylinder process are themselves involved, then we find the characteristic deluzions of persecution predominate to the exclusion often of such optimistic states; and the profound implication of the "motor element" of mind may call forth ideas of restricted politional freeden and reactive capacity. In all the more characteristic phases of chronic alcoholism we never full to identify these profound lesions within the white medallated substance of the fronte-parietal lobe, associated with the degeneration and breaking-up of the large "anotorcells" and spinelleseries. Whiles, therefore, the certical lesions of general paralysis indicate an invasion from without inwards, affectingthe sensory elements and apical (I sensory) poles of the motor-cells, alcoholism induces, in addition thereto, extensive vascular changes. from within outwards, implicating the medulls of the gyrs, and effecting a destructive degeneration of the meduliated fibres.

Spinal Cord. The morked changes found in the spinal axis can scarcely be refrested, in any typical case of alcoholism, to one of the strict system affections of the cord; they are too polpobly of the nature of a slowly-enersaching selecous change encircling the cord, originating in its investing membranes, and creeping inwards along the vascular tracts, and especially along the posterior median raphe. There is also, andountedly, a tendency in such cases to a frequent implication of the posterior nerve-roots by a similarly-disposed lesion spreading into its structure from its perineural investment, inducing a change quite dissimilar in nature to teat of the so-called multiple negritis, which also occurs in chronic alcoholism. The investing cone of sclerosis is by no means uniformly advanced at all points; more frequently we observe a decided preponderance at certain definite area-e.g., the marginal are of the lateral column on one or on both sides; or the segment inmediately adjacent to the posterior aervercents; or, occasionally, a section of the outer margin of the anterior rost some; and, very frequently, the posterior median raphé, spreading theaes throughout the columns of Goll. Whence this tendency to arise at different sites? What are the determining factors? Although we cannot reply to these questions with full assurance at present, yet it is a fact of no little significance that such lesions are, as in general paralysis, distributed along the columns which are in anatomical connection with discharging tracts at higher levels in the corobram; and that, as in general paralysis, we find system degenerations established apparently



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along columns in physiological sympathy with diseased tracts higher up, yet not by murbial continuity; so here, also, the functional disturbances aroused in the cortex may, probably, by inducing continuous engorgement along certain spinal tracts, by the hypersetivity of their conducting strands, determine to that region the chief meebid implication. The symptoms accord with this mode of implication, for we first get decided evidence of a very chronic leptomenicapitis, which precedes symptoms of ascending and descending changes secondarily indiced by the spread of the lenion inwards; and, still later, we find the central grey matter and special cell-groups implicated apparently by extension along the nutrient veneds, by the same lesion. That the symptoms vary grently in individual cases is not surprising, as they wholly depend upon site and depth of implication of the cord.

The lumber cord may be the first affected, and the deranged sensory and motor symptoms be limited wholly to the legs; or, again, ciffness or spaim of the neck and retraction of the head may indicate corvical implication; or the derail region may be the site of most pronounced implications; the nertical secont of the maningeal affection may be alight or universal.

The constitutional state engendered in chronic alcoholic manaty as identical with what forms the basis of chronic Bright's disease; and as in this affection we have a multiplicity of local expressions of the morbid leatons, so here we find the tendency is towards a concentration in the nervous centres; alrephic states of locals, or of spinal cord, or of both combined, are thus induced from predeminance of—

- (a) Sumple fatty degeneration of their natritive vessels and tissues.
- (b) From fatty degeneration associated with interstitial advention.
- (c) From stiffuse selerous, interstitial change.
- (d) From periarteritis and hypertrophy of the fastin macaleris.

In the periarteritis, occasionally engendered in chronic alcoholics of a certain age, we probably see the pathological boundary line overstepped betwist simple alcoholic immitty and general paralysis of the imane; and we have resulting therefore, in a more scate spendi of the certical boices, what might be regarded as general paralysis accidentally ovelved out of chronic alcoholism, or, as some would loss correctly state the case, general paralysis consect by alcohol. Alcohol has its own role to play, and a most extensive one it is; but, the times-changes engendered thereby are always as highly characteristic as are the morbid sequences of general paralysis, and we must seek to discover from the latter disease our notions of alcohol playing the part of a direct ethological factor, in the sense of originating the primal times-changes by which this disease is characterised.

In the notable thickening of the nesscular tunic of the arteries seen in the spenal cord, in certain cases of alcoholic massity, we find the

general symptomatology points to the degravation of the nutrient fluids, to the especially-vittated state of the blood, mal-assimilation, disordered digestion, deranged excretory functions, bringing in their wake the resultant changes in the arterial tunios. In such cases, as we have seen, the membranes of the cord presented no notable change, and no coarse aclerous hands of connective invaded the columns; the symptoms, which were those of an ataxic pompleyis of very gradual accession, were explained by the great predominance of moreogenicalle along the commissural and of the raphs, with morbid vaccularity of the posterior columns at this site, the vessels all presenting creat. hypertrophy of their muscular tunic; a remarkable abundance of amploid hodies was spread throughout the peripheral areas of the oxed, and especially the posterior columns. The lateral columns exhibit a very fine punctated connective, which has induced a certain degree of atrophy of the nerve-tubuli, whilst here also the characteristic hypertrophied nuncular results prevail abuniantly throughout all regions of the cord. Nor must we fail to call attention to the fact. of insulication of the viscoral column of the cord-the residuir formation of Clarke. A very general implication of the blood vascular system prevails; the great vessels undergo fatty and atheromatous change; and the circulatory centre itself-the heart-teing an early sufferer. its muscle succumbs to facty infiltration and degeneration, its cavities dilate, and its vital espacity is profoundly restood. Corresponding changes appear in the large vessels at the base of the brain, which become atheronatous and distorted. It is this enfectionsent of centric circulatory energy, furthered by the retarded flow of blood in the minute renels, which calls forth that compensatory increase of the manualse tunic of the cecebral and apinal arteries. Another factor, of great moment here for avil, must not be overlooked, that is, the diminished eis a fronte of cortical areas, which normally favours circulation; a failure due to the devitalisation by alcohol of the nervetisme, and possibly the inherited enfectlement of neuratic descent.

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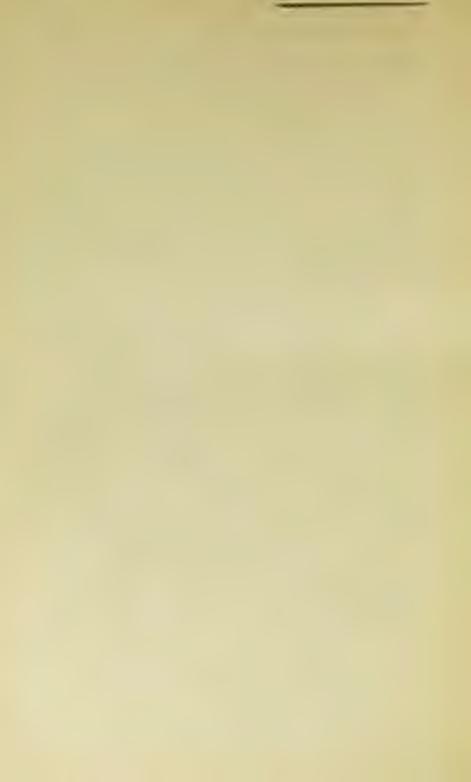
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